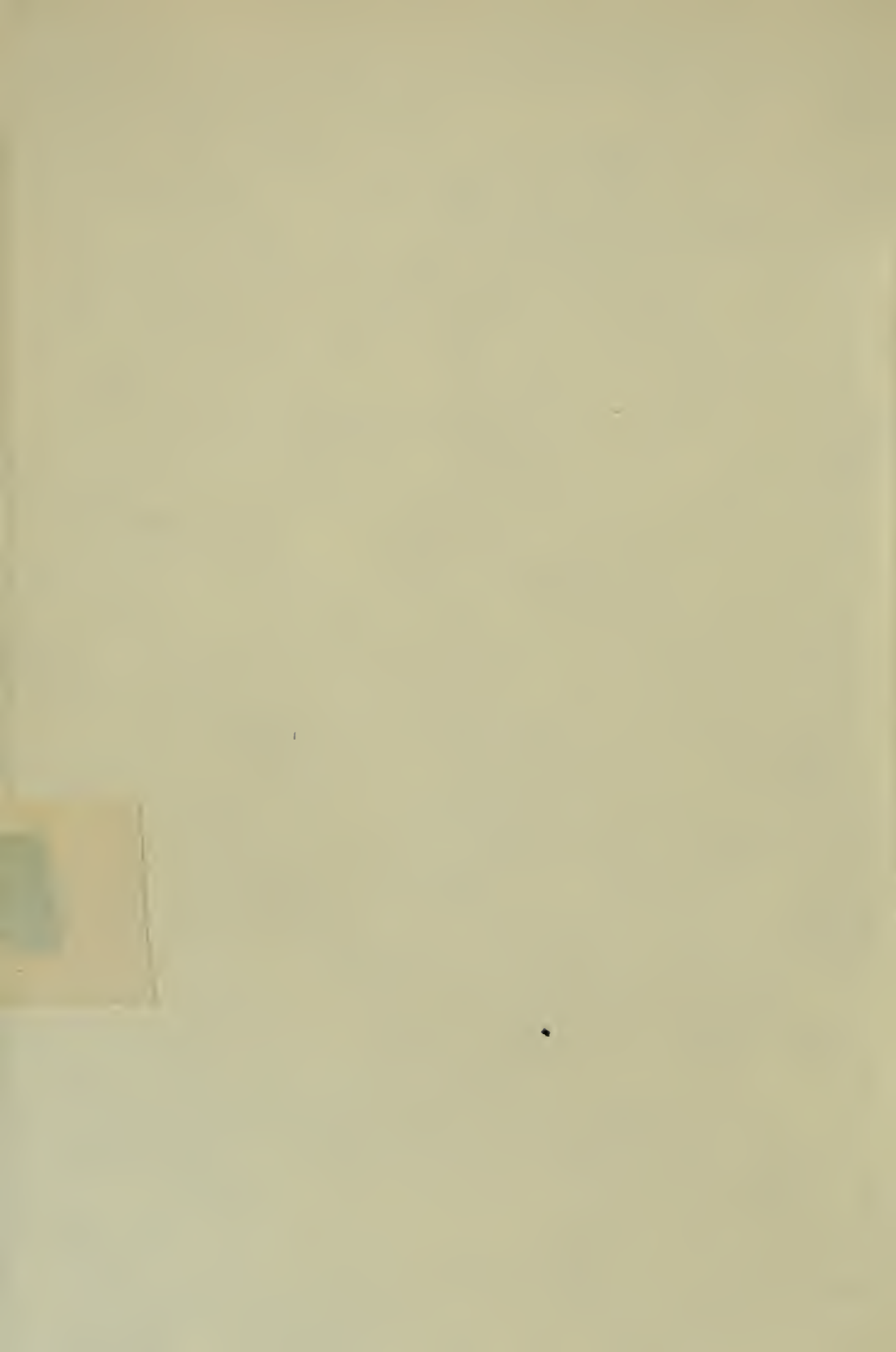






PROCEEDINGS
OF THE
ROYAL SOCIETY OF MEDICINE

EDITED BY

(October, 1913—May, 1914)

JOHN NACHBAR, M.A., M.D.

AND

(June—July, 1914)

J. Y. W. MACALISTER

UNDER THE DIRECTION OF
THE EDITORIAL COMMITTEE

VOLUME THE SEVENTH

SESSION 1913-14

PART I

MARCUS BECK LABORATORY REPORTS

OCCASIONAL LECTURES

NOTES ON NEW BOOKS

SECTION OF ANÆSTHETICS (1) BALNEOLOGICAL & CLIMATOLOGICAL SECTION

(2) SECTION FOR THE STUDY OF DISEASE IN CHILDREN

(3) CLINICAL SECTION (4) DERMATOLOGICAL SECTION

(5) ELECTRO-THERAPEUTICAL SECTION

(6) SECTION OF EPIDEMIOLOGY AND STATE MEDICINE



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PROCEEDINGS

OF THE

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VOLUME THE SEVENTH

COMPRISING THE REPORT OF THE PROCEEDINGS FOR THE
SESSION 1913-14

Sec. I.
GENERAL REPORTS



LONDON

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1914

The Royal Society of Medicine.

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MARCUS BECK, M.S.Lond., F.R.C.S.Eng.

Born 1843. Died 1893.

Professor of Surgery, University College, London; Surgeon to
University College Hospital; Fellow of the Society.

The Royal Society of Medicine.

The Marcus Beck Laboratory.¹ A Tribute to the Memory of Marcus Beck.

By FREDERICK T. ROBERTS, M.D., D.Sc., F.R.C.P.

It would be difficult to choose a name which could more appropriately be associated with a practical effort to advance the science of medicine by means of experiment and expert observation than that of Marcus Beck, and the announcement of the opening of the Laboratory to commemorate him was cordially approved by the Fellows, not only by those who had been privileged to know him personally, but also by the later generation who only know his name as one of the most honoured in modern British surgery.

As the first results of the investigations carried on in the Laboratory are now to be published in the *Proceedings*, it is only fitting that, as an introduction to the Report, should be presented a short notice of the remarkable man whose memory is thus perpetuated for the esteem and admiration of future generations of Fellows, so that they may understand in some measure on what grounds the choice was made by those who knew him well, and had a sincere regard and, in most cases, a deep affection for him.

Marcus Beck came of a scientific stock on both sides of the family, and several of his predecessors had done excellent practical work. But of more immediate importance in developing his hereditary bias is the fact that, at the very outset of his professional career, he came under the direct guidance of his even then highly distinguished relative, Joseph Lister, who was at the time Regius Professor of Surgery at Glasgow University, and was deeply engaged in his investigations relating to antiseptic surgery. Beck entered as a student at Glasgow in 1860,

¹ The Laboratory was endowed by a brother who was greatly attached to him.

and lived under his kinsman's roof for three years, thus being brought into intimate association with this striking personality, who must not only have influenced him generally, but have given his mind a special impetus in the direction of surgical pathology and research, which no doubt materially affected his subsequent career.

In 1863 Beck entered as a student at University College, London. He soon gave evidence of unusual abilities, and his career there was highly successful. At the University of London also he distinguished himself in a remarkable way, finally obtaining the Gold Medal in Surgery at the examination for the M.S. degree. As a matter of course he became F.R.C.S. In connexion with University College and Hospital he held the appointments of House Physician and House Surgeon; and subsequently in succession those of Demonstrator of Anatomy, Surgical Registrar, Assistant Surgeon, Teacher of Operative Surgery, Professor of Clinical Surgery, full Surgeon, and finally Professor of Surgery in 1885. In 1890 he was elected a member of the Council of the Royal College of Surgeons at a comparatively early age and on his first candidature, having previously been appointed a Member of the Court of Examiners. He also examined at several Universities.

Such is a brief summary of Marcus Beck's public professional career and its progressive steps upwards, which shows not only his undoubted ability, but also the high estimation in which he was held by his colleagues, and by those connected with the College and the Hospital who were concerned in his election to the several posts he occupied, and their appreciation of his valuable services. As a matter of fact, he carried all before him.

From the first, and throughout his professional life, Beck had the deepest interest in Surgical Pathology. In preparing the elaborate Reports and in the methodical arrangement of the Surgical Notes of cases in the Hospital, while Surgical Registrar, he gained that knowledge which has been described as "accurate, profound, and supremely living," and which was one of his distinguishing characteristics. He also undertook the monumental task of supervising and cataloguing the surgical pathological specimens in the University College Museum, and the amount of labour and careful research which he gave to this work can hardly be estimated by those who have since benefited by the published results. Another scientific investigation which he helped to carry out in relation to surgical pathology was that on the nature and causes of pyæmia, septicæmia, and purulent infection, when a member of the Special Committee appointed by the Pathological Society in 1879 to

inquire into and report on this subject. Here again the amount of work he undertook was enormous, and its results were most valuable. He had previously been for several years a member of the Morbid Growths Committee of that Society. Beck taught emphatically that the only safe basis of surgical practice was a groundwork of scientific pathology. His own work in this department was always of the highest quality. At the same time, he was thoroughly familiar with clinical surgery, a sound practical surgeon, and an accomplished and successful operator. As might have been anticipated from his early association with Lister, Beck was one of the first in London to teach and practise antiseptic surgery, which he did with such energy and enthusiasm that University College Hospital became one of the pioneers in this great revolution in surgical treatment.

Marcus Beck contributed but little to current medical literature, as represented by journals and societies, and did not publish any independent treatises. In addition to those already mentioned, his chief contributions were the valuable monograph on secondary diseases of the kidney, "Nephritis and Pyelitis consecutive to Affections of the Lower Urinary Tract," in Reynolds's "System of Medicine," vol. v; and several excellent articles in Quain's "Dictionary of Medicine" and Heath's "Dictionary of Practical Surgery." Another most important work which he carried out with remarkable skill and judgment was the editing of the eighth and ninth editions of Erichsen's "Science and Art of Surgery." It may be of interest to note here that Beck was intimately associated with Mr. (afterwards Sir John) Erichsen during the whole of his professional life, from the time that he was his house surgeon, and their relations towards one another were those of profound mutual esteem and affection.

One of the most interesting and important aspects of Marcus Beck's active life was his work as a lecturer and clinical teacher. In these capacities he was eminently successful, and his instruction was always highly appreciated by those who were privileged to be his pupils. His systematic and clinical lectures were generally thronged. He loved this branch of his work, and threw himself heart and soul into its satisfactory accomplishment, taking the utmost pains to prepare himself for the duty, and doing a huge amount of work with the sole object of being able to teach the students thoroughly. He was devoted to his hospital work, and studied exhaustively the cases for clinical instruction, also carrying out any researches in connexion with them which he deemed necessary. Beck's systematic lectures are said to have been models of

lucidity. His teaching dealt chiefly in broad and fundamental principles; it was expressed with striking brilliancy, aptness of illustration, and vividness of description. He often made prolonged visits to the wards, and was never tired of clinical teaching and demonstration, during which the facts of surgery were made highly attractive to those who listened. At the same time, while giving of his best to those who looked to him for instruction and grounding in the principles of surgery, he encouraged the utmost intellectual independence among them, and was only too pleased when they attacked him with questions and arguments. There can be no doubt that a large number of University College men who have become eminent surgeons owe their success to the fact that they had been pupils under Marcus Beck. It may further be affirmed that by the students generally he was not only greatly admired, but beloved in a degree that rarely falls to the lot of a teacher.

Marcus Beck was an attractive personality, and withal very good-looking even to the last. As a young man he is described as having been remarkably handsome, robust, and of great bodily vigour, delighting in out-door exercise. Although he presented symptoms of diabetes for nearly twenty years, he never allowed the complaint to interfere with his ordinary life and work, showing the grit that was in him. His physical strength was said to have been enormous even up to eighteen months before his death. Beck's prominent personal characteristics were an overwhelming sense of duty, sometimes carried to a degree which was almost quixotic, love of truth, honesty of purpose, and thoroughness in carrying out any work he undertook. He performed his hospital duties most conscientiously, and with extraordinary patience and zeal; no patient was ever neglected by him. His researches before arriving at any conclusion were most carefully and exhaustively made. He occasionally exhibited a somewhat cold and cynical manner, but his cynicism was superficial and of a genial quality. In reality Beck had a truly noble nature, with a loving and tender disposition, which overflowed with kindness and sympathy. These qualities were often revealed in his attitude towards patients, and his emotional anxiety on their behalf was sometimes quite distressing and painful to witness. At the same time, he could speak his mind freely and say hard things, giving vent to a caustic wit, for he had strong views on certain questions, hated anything approaching cant or humbug, and was impatient of all affectation or pretence. He did not, however, willingly give offence or intentionally hurt anyone's feelings, and was

always ready to express regret or apologize when necessary, and to soothe ruffled feelings. Personally, Marcus Beck was absolutely incapable of a dishonourable action or mean thought; entirely free from petty spite or jealousy; and strictly honourable in all his dealings. Undoubtedly, he exhibited a personal magnetism which made a deep and lasting impression on those who were privileged to know him intimately; and produced a remarkable influence over the minds of his pupils and his contemporaries. It has been well said that it was impossible to help loving him; or to imagine that he ever made an enemy. It afforded his friends particular pleasure to meet Beck in private life, and especially in the midst of his family circle at Isleworth. There he was always genial, happy, and full of humour. His devotion to his beloved old Mother was delightful to witness and truly pathetic. She on her part adored him, and was extremely proud of her distinguished son.

Marcus Beck never came prominently before the public as a consulting surgeon and operator, nor did he take the position in these capacities which was his by right. This was partly due to the state of his health, for he felt that he could not bear the strain of both private practice and hospital and teaching work. He chose the latter without hesitation, which fitted in perfectly with his natural inclination and principles, and he never regretted his choice. He kept very much to himself and his small circle of intimate friends, and took no part in London social life. Moreover, he had a sense of personal and professional dignity which made him absolutely incapable of self-advertisement of any kind, and sometimes he would comment sharply on the methods by which consulting practice is promoted and encouraged. He never regarded the acquisition of fees as an object in life, and his feeling towards the commercial side of his profession was one of hatred and scorn. But, in spite of himself, private practice did come to him in an increasing degree, and his advice and help as an operator were more and more sought after, so that if his life had been more prolonged there is little doubt he would have been compelled by the course of events to take a more prominent position as a consultant.

For some time before his death Beck's friends had noticed a change in him which caused anxiety. In May, 1893, he had an attack of influenza from which he apparently recovered, but diabetic cerebral symptoms supervened, ending in coma which closed the scene on May 21. Thus passed away, in his fiftieth year and in the prime of life, one of the most remarkable and beloved personalities that ever

adorned the ranks of the medical profession. He was interred at Brentford in the burial ground of the Society of Friends, in the presence of his colleagues, a large number of past and present pupils, and many professional and private friends and admirers. He was deeply mourned, and the whole profession was conscious of a loss, profound and irreparable. May the memory of Marcus Beck never be allowed to fade!

The Royal Society of Medicine.

Marcus Beck Laboratory Reports.—No. 1.

The Cultivation of Human Tumour Tissue *in vitro*.

By DAVID THOMSON, M.B., Ch.B.Edin., D.P.H.Cantab.,¹ and
JOHN GORDON THOMSON, M.A., M.B., Ch.B.Edin.²

Read before a Meeting of the Society on May 11, 1914.

The PRESIDENT, Sir FRANCIS H. CHAMPNEYS, Bt., M.D., in the Chair.

MR. PRESIDENT AND GENTLEMEN,—

These researches on the Cultivation of Human and other Tissues were carried on in the Marcus Beck Laboratory, in this building, by Dr. J. G. Thomson, as Beit Memorial Research Fellow, and by myself, as Grocers' Research Scholar, under the directorship of Sir Ronald Ross. The work represents the first-fruits of the Laboratory, and it is only right that on this account we should make a brief reference to the memory of Marcus Beck. It would be indeed ungracious not to take special notice of the fact that the facilities we have enjoyed are due to the respect which he inspired, and which led to the generous donation to which the Laboratory owes its existence. A portrait of Marcus Beck hangs in the Laboratory, and underneath are his favourite verses, one of which reads as follows :—

“ I need not be missed if another succeed me,
To reap down those fields which in Spring I have sown,
He who ploughed and who sowed is not missed by the reaper,
He is only remembered by what he has done.”

¹ Grocers' Research Scholar.

² Beit Memorial Research Fellow.

Those among us who did not know Marcus Beck do not miss him, but we are now reaping the advantage from the Laboratory which he has inspired, and on account of which he will always be remembered. Before proceeding with my lecture I wish also to thank the President, the Council, and Mr. MacAlister for the facilities that they have given us in connexion with our work in this building.

(I) INTRODUCTION.

THE discovery of the method of cultivating tissues *in vitro* by Harrison (1910) has opened up a wide field for research. It is unwise to prophesy how far this new power will develop, but undoubtedly it will lead to discoveries of great importance. In June, 1913, we attempted to cultivate human tumour tissue in the medium employed for cultivating the malarial parasite *in vitro*—viz., in fresh defibrinated human blood containing 0·5 per cent. of glucose. Small pieces of breast carcinoma were placed in test-tubes containing this medium and incubated at blood heat. Smears of the surface of these portions of tumour before inoculation, and again after one to two weeks' incubation, showed that new elongated cells had developed in the medium on the surface of the tissue. These were probably new connective tissue cells. This medium and method were, however, unsatisfactory. In September, 1913, one of us (D. Thomson) visited the Rockefeller Institute in New York and through the kindness of Dr. Carrel, whose excellent work on this subject is well known, was able to acquire the technique necessary for this research. Carrel has worked chiefly with the tissues of the chick embryo, and we have attempted the cultivation of human tissue on similar lines. The human tissue necessary was obtained at the Middlesex Hospital from operations performed by Sir John Bland-Sutton, to whom we are much indebted. As soon as the tumour or other human tissue was removed from the patient it was placed in a sterile bowl. A small piece was immediately cut out with aseptic precautions and transferred to a test-tube containing 5 to 10 c.c. of sterile Ringer's solution. This was placed in a Thermos flask to which some water about blood heat was added. The tissue was in this way transferred to the laboratory as quickly as possible and then planted into the necessary medium and incubated at $37\cdot5^{\circ}\text{C}$. The space of time which elapsed between the removal of the tissue from the patient and its transference in the culture medium to the incubator was as a rule about two hours.

(II) THE CULTURE MEDIUM.

It seems to be generally believed that the tissue of a given animal can only be cultivated in the plasma of that species of animal, so that to grow chick tissue the plasma of a fowl is employed. The tissues of the frog, rabbit and guinea-pig have been grown always in the plasma of the frog, rabbit and guinea-pig respectively. With this idea it seemed necessary to employ human plasma for the cultivation of human tissues. We commenced our work, therefore, by using human blood plasma for the medium, but found this inconvenient and troublesome, chiefly on account of the rapidity with which human plasma clots. It was found later by one of us (D. Thomson) that human tissues could be grown satisfactorily in fowl plasma, and as this plasma can be kept fluid in paraffined tubes in the ice-chest for several months, it formed a much more convenient medium for our work. In this research the total number of inoculations of pieces of human tissue into various modifications of plasmatic media was fifty. Nine different tissues were employed—viz., liver, uterine fibroma, papillomatous tumour of the ovary, ovary, skin epithelium, scirrhus cancer of the breast, cancerous lymphatic gland, voluntary muscle, and scrapings of epithelial cells from the inner surface of the Fallopian tube. Of these nine species of tissue, only three showed distinct and definite growth in the medium—viz., the papilloma of the ovary, the ovarian tissue itself and the cancerous lymphatic gland. Slight growth took place in the case of liver and fibroma. It seemed to us that extract of the tissue itself should be added to the fowl plasma medium in order to get good growth. No extract was added in the case of the liver, and this possibly explains the slight growth in this case. Also in the case of the fibroid scirrhus cancer of the breast and the fibroma of the uterus no extract was added, because the tissue was so hard that we were unable to get an extract from it. Hard fibrous tissues did not grow well, but whether this was due entirely to the lack of extract we are unable to state. Soft tissues, such as could be easily mashed up for the purpose of getting an extract grew best, but whether this was due to the addition of the extract to the medium we are not prepared to state. Later we found that the best growth of human tissue which we have so far obtained occurred in a medium composed of fowl plasma one part plus chick embryo extract one part. The growth was more successful in this medium than in the medium composed of fowl plasma one part plus

extract of the given tissue one part, so that it would seem that extract of chick embryo can take the place of the human tissue extract.

It would appear to us, therefore, that for tissue growth one should employ plasma plus extract, and that the plasma and extract do not require to be specific. There would seem to be no reason, therefore, why certain human tissues and tumours should not be successfully transplanted into a fowl, since the tissues of certain mammals, including man, grow successfully in fowl plasma plus extract of chick embryo.

(III) TECHNIQUE.

The medium is transferred by means of sterile Wright's pipettes to a sterile cover-slip. A tiny piece of the tissue is then placed in this medium and the cover-slip inverted over a hollow in a thick glass slide. The cover-slip is hermetically sealed to the slide by painting melted paraffin around the margin of the former. The preparation is then placed in the incubator at 37.5° C. A culture of this kind can be examined at any time by the low powers of the microscope, and sometimes even the oil-immersion lens can be focused on the growing cells.

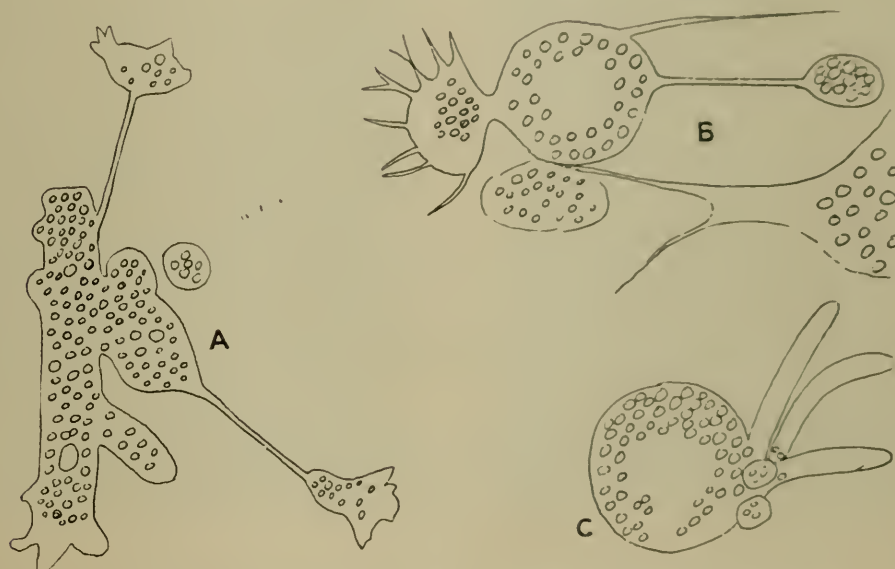
(N.B.—The plasma medium clots after some time so as to form a transparent jelly. This clotting occurs much more quickly when extract of chick embryo is added.)

(IV) THE GROWTH OF THE TISSUES.

We have attempted to illustrate this by means of successive photomicrographs of the live tissue.

(a) *Papilloma of the Ovary*.—This was a very soft tumour about the size of a child's head. It was described by the pathologist as an intracystic papilloma not truly malignant. The tissue of this tumour was apparently composed entirely of round cells, there being apparently no fibrous stroma present. A tiny portion, about 1 mm. in square area, was placed in a medium composed of fowl plasma one part, Ringer's solution (containing 0.5 per cent. of glucose) one part, and extract of the tumour in Ringer's solution one part. On the third day of incubation definite buds of growing tissue appeared. On the fifth day these were quite distinct, as shown in fig. 1, Plate I; and on the eighth day the amount of growth had considerably increased (fig. 2). This growth consisted of a solid extension of epithelial cells. As the growth extended it caused some liquefaction of the medium, which was of a gelatinous consistence,

and in the more liquefied parts the new growing cells were more scattered (fig. 3), but as a rule they remained in contact with each other by means of long, fine protoplasmic connexions (figs. 7, 8 and 9, Plate II). The new actively proliferating cells varied markedly from the cells of the original tissue planted in the medium. The appearance of the original cells is seen in fig. 4; while fig. 6 shows the original cells on the left and the new growing cells on the right. The latter are also seen in figs. 7, 8, 9 and 10. It is distinctly noticeable, therefore, that the new actively growing cells are large and amœboid, with long processes which communicate with each other, and they also contain large highly refractile granules. The original cells, on the other



Papilloma of ovary. Growth *in vitro*. Diagrams A, B and C represent the remarkable amœboid shapes of the growing cells. ($\times 600$.)

hand, are much smaller. They show no amœboid processes and do not exhibit amœboid movement, and they contain few or no large refractile granules. The amœboid movement of the larger growing cells was very remarkable, as illustrated in the diagrams A, B and C. On the fourteenth day of incubation the new cells began to show signs of degeneration (fig. 11), and on the fifteenth day almost complete autolysis took place (fig. 12). There was no bacterial infection to account for this autolysis. It is possible that the cells, after having lost their vitality, were dissolved by their own ferments. We were unable to determine the exact nature of the highly refractile granules; most probably they were fat droplets. The smaller granules were seen to run

EXPLANATION OF PLATE I.

FIG. 1.—*Tissue* : Intracystic papilloma of human ovary (bordering on malignancy). *Medium* : Fowl plasma one part, Ringer's solution plus glucose one part, extract of the tissue one part. Photomicrograph of live tissue taken on the fifth day of incubation shows commencing growth. ($\times 40$.)

FIG. 2.—The same specimen, eighth day of incubation, showing further growth. ($\times 40$.)

FIG. 3.—Another portion of the same specimen, tenth day of incubation, showing outgrowth of large epithelial cells. ($\times 75$.)

FIG. 4.—Photomicrograph of unstained wet film of original tumour cells. ($\times 400$.)

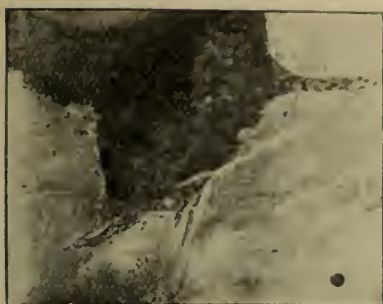
FIG. 5.—Photomicrograph of unstained wet film of the tumour cells after incubating for thirty days in ascitic fluid. Note the star-shaped masses of crystals. ($\times 400$.)

FIG. 6.—Photomicrograph of growing cells (same specimen as figs. 1, 2 and 3), tenth day of incubation. Original cells on left, growing cells on the right. Note the increase in size of the growing cells and also the appearance of large granules. ($\times 400$.)

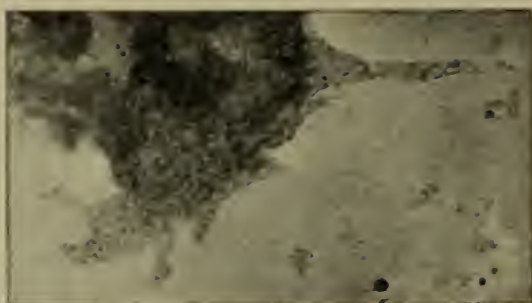
N.B.—Figs. 4, 5 and 6 are identically magnified. ($\times 400$.)

PLATE I.

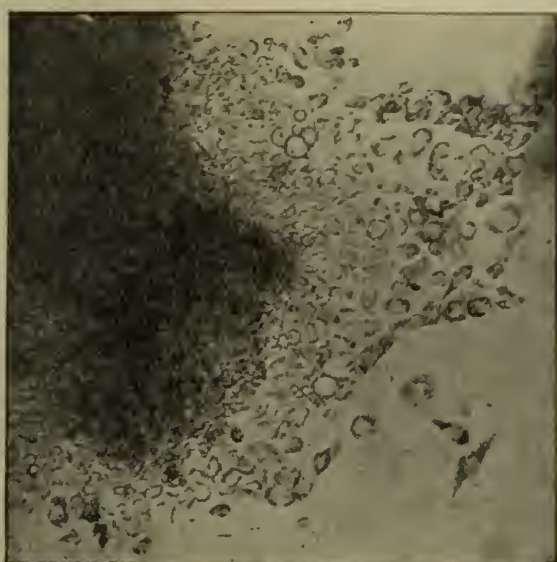
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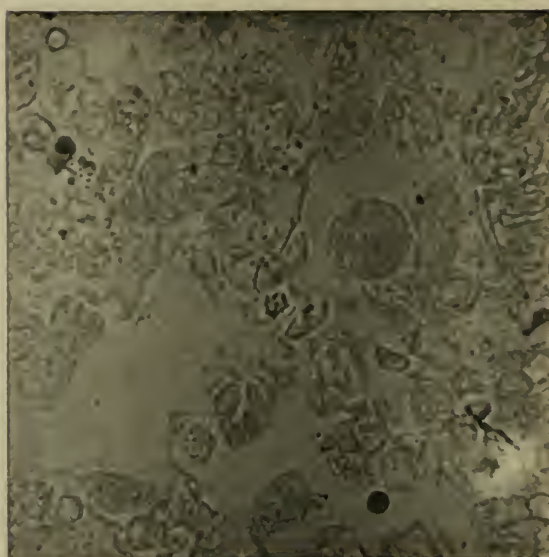
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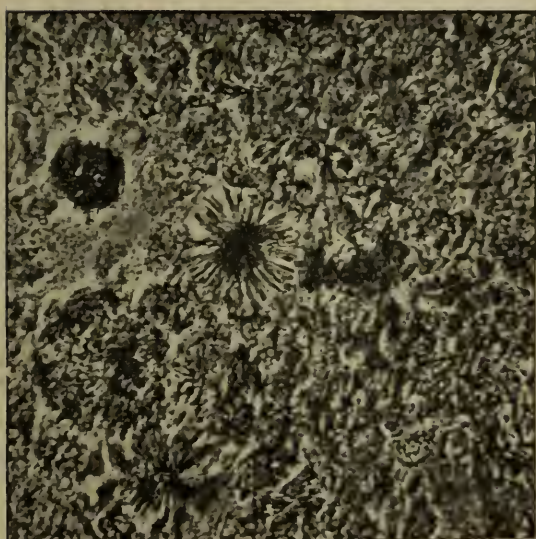
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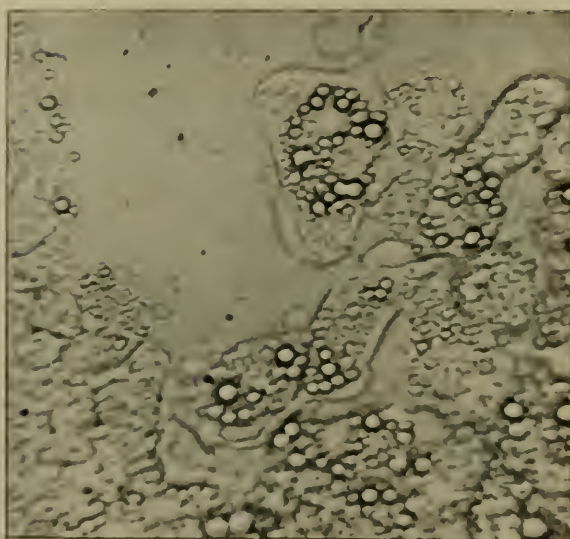
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6



EXPLANATION OF PLATE II.

FIG. 7.—Same specimen of live tissue, ninth day of incubation. Shows amœboid processes in the growing tumour cells. Fine granules are seen at the terminal ends of these processes. ($\times 400$.)

FIG. 8.—Same specimen of live tissue, ninth day of incubation. Shows amœboid processes of the larger tumour cells. ($\times 720$.)

FIG. 9.—Same specimen of live tissue, ninth day of incubation. Shows similar processes; one process ends in a mass of granules. ($\times 720$.)

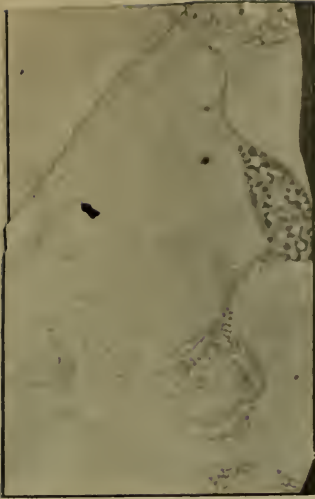
FIG. 10.—Same specimen of live tissue, ninth day of incubation. Shows the large size of the growing cells which always contain granules. ($\times 720$.)

FIG. 11.—Same specimen of live tissue, fourteenth day of incubation. Shows commencing autolysis of the growing cells. ($\times 400$.)

FIG. 12.—Same specimen of live tissue, fifteenth day of incubation. Shows complete autolysis of the growing cells. ($\times 400$.)

PLATE II.

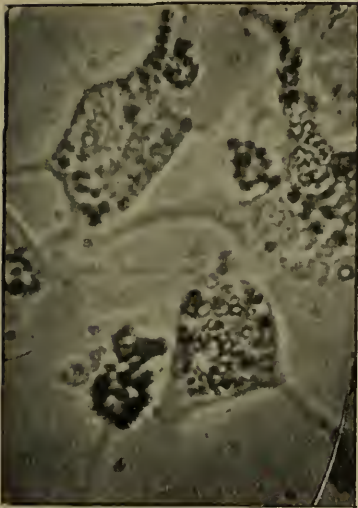
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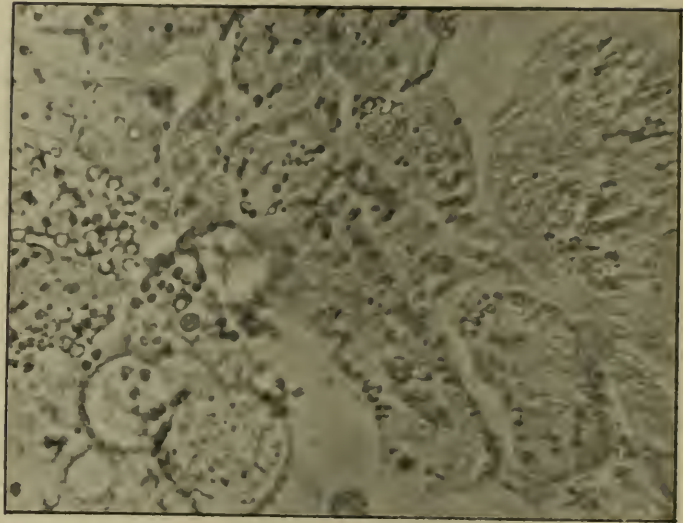
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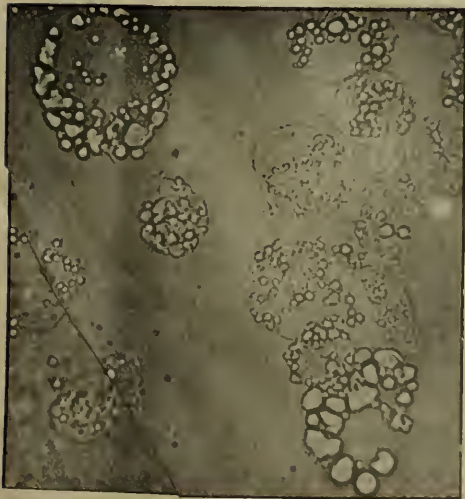
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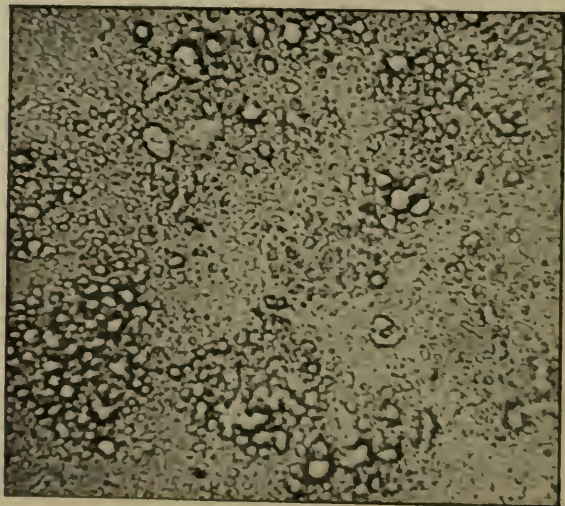
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along the pseudopodia of the cells at times, and were frequently extruded from the ends of those processes into the surrounding medium. Fig. 7 shows the granules in the fine pseudopodia very clearly. Another point of interest in connexion with this tumour tissue was the development of stars of fine crystals (fig. 5, Plate I) after the culture preparation had been kept for about four weeks. These stars also developed in the tubes of ascitic fluid to which pieces of the original tumour had been added, and incubated for a month or more. They appeared to resemble tyrosine crystals in some respects, and evidently they indicate the presence of some chemical substance in the tumour.

(b) *Carcinomatous gland from the neck*, secondary to carcinoma of the floor of the mouth. Small pieces of this tissue were inoculated into six variations of fowl plasma medium as follows:—

- (1) Fowl plasma one part plus extract of the cancer gland one part.
- (2) Fowl plasma one part plus extract of the cancer gland one part and of chick embryo one part.
- (3) Fowl plasma one part plus extract of chick embryo one part.
- (4) Fowl plasma one part plus Ringer's solution two parts plus cancer gland extract two parts.
- (5) Fowl plasma one part plus glucose Ringer's solution one part and cancer extract one part.
- (6) Fowl plasma one part plus ascitic fluid one part plus cancer gland extract one part.

Successful growth was only obtained in No. (3) medium, and very slight growths occurred in (2), (4) and (5), and no growth was observed in (1) and (6). It appeared, therefore, that fowl plasma plus extract of chick embryo formed the most suitable soil. In this medium an outgrowth of branching cells from the original tissue was seen after forty hours' incubation at 37.5° C., as seen in fig. 18, Plate III. After five days' incubation there appeared, in several places, solid buds composed of epithelial cells, and these increased in size day by day (figs. 13, 14, and 15). Fig. 16 shows an outgrowth of new epithelial cells (presumably cancer cells) after nine days' incubation, and fig. 17 shows the further extension of the same portion four days later—i.e., after thirteen days' incubation. At the same time the long branching cells continued to extend further into the medium (fig. 19). The latter most probably represent the growth of the stroma cells of the cancerous gland tissue. It is interesting to note that no such branching cells grew from the epithelioma of the ovary already described, and we have already pointed out that that tumour consisted only of epithelial cells, and apparently contained no stroma. It was a soft, friable tumour,

whereas the cancerous gland was more tough and fibrous. The growing epithelial cells of the cancerous gland were, as in the case of the papilloma of the ovary, larger and more granular than the original cells; also they were amœboid and irregular in shape. The growing cancer cells were packed with fine refractile granules, finer than in the case of the growing papilloma cells of the ovary. The growth of the cancer began to flag after the thirteenth day, and I made a permanent preparation of the specimen on the fifteenth day. The stained specimen showed a slight infection with bacilli, most probably an extraneous or secondary infection of the original tissue.

(c) *The Ovarian Tissue*.—This grew successfully in a medium composed of fowl plasma one part plus Ringer's solution one part plus extract of ovary (in Ringer) two parts. A definite outgrowth of long, branching cells appeared after forty-two hours' incubation. This growth increased for six days when, unfortunately, the cover-glass was broken in an attempt to focus the oil-immersion lens on the tissue. The outgrowth of long, branching cells in this case was presumably only connective tissue stroma cells. No outgrowth of epithelial cells appeared.

(V) FURTHER OBSERVATIONS.

Parallel with these researches in the cultivation of human tissues we have investigated the growth *in vitro* of the tissues of chick embryos, &c. A special article has been devoted to this work, with a detailed description of the technique. Plasma medium is more or less solid in consistence, and it would appear to us that, in this medium, cells of all kinds have a tendency to elongate and throw out protoplasmic processes, whether they be epithelial cells or cells of connective tissue. But the cells of each species of tissue retain their characteristic appearance in many respects. The connective tissue cells elongate and branch very markedly, whereas the epithelial cells do not elongate so much, and although they tend to send out long processes they do not branch in the true sense of the word, and, unlike the connective tissue cells, they tend to keep together in a solid, advancing growth. So far we have been unable to get any proliferation of true muscle tissue, but liver and kidney epithelium have been grown, also spleen, bone-marrow, the tissue of young feathers, and also the tissue of the brain.

With regard to the scraping of the inner surface of the human Fallopian tubes, we were unable to find any definite proliferation of the epithelial cells, but the cilia of these cells kept in active motion for forty

EXPLANATION OF PLATE III.

FIG. 13.—*Tissue*: Carcinomatous gland removed from neck by Sir J. Bland-Sutton. *Medium*: Fowl plasma one part, extract of chick embryo one part. Photomicrograph of the live tissue after five days' incubation. Shows outgrowth of elongated branching cells (probably stroma cells), and also commencing budding of the epithelial cancer cells. ($\times 66$.)

FIG. 14.—The same portion of tissue after six days' incubation. Note appearance of a new epithelial bud. ($\times 66$.)

FIG. 15.—The same portion after nine days' incubation. Note further extension of epithelial cells, and increase of branching cells. ($\times 66$.);

FIG. 16.—Another portion of same specimen after nine days' incubation. Note marked outgrowth of epithelial cancer cells. ($\times 66$.)

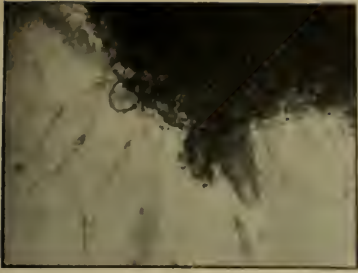
FIG. 17.—The same portion after thirteen days' incubation. Showing marked increase of epithelial cancerous growth. ($\times 66$.)

FIG. 18.—Another portion of the same specimen after four days' incubation. Showing commencing outgrowth of branching stroma cells. ($\times 66$.)

FIG. 19.—The same portion after ten days' incubation. Shows marked increase of branching stroma cells. ($\times 66$.)

PLATE III.

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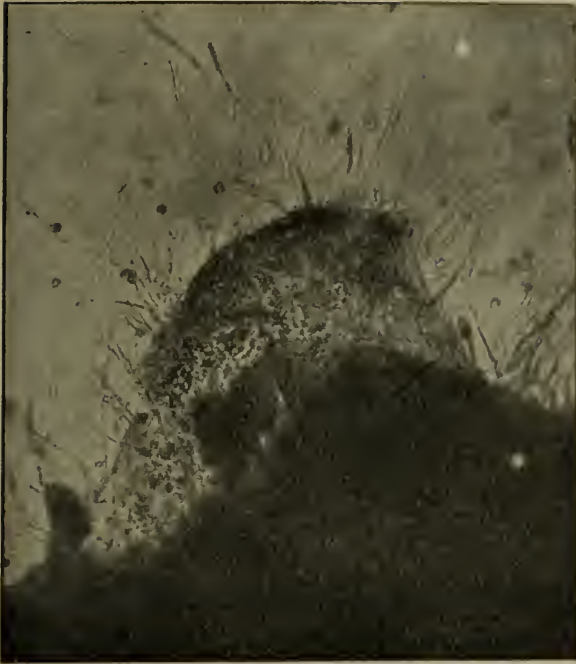
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hours after they had been transferred into culture medium. The growth of human and other mammalian tissue was much slower than that of chick embryo tissue. In the latter, definite growth took place in twenty-four hours, and it continued to grow for three to five days, after which time the growth ceased and degenerative changes occurred, unless it was transplanted into fresh medium. With human and other mammalian tissue, on the other hand, no very definite growth occurred until about the fifth day, and this continued to increase till about the twelfth or thirteenth day, when it ceased and began to degenerate. We have not attempted so far to transplant growing human tissue into fresh media to prolong its life.

(VI) SUMMARY AND CONCLUSIONS.

(a) Growth of human tumour tissue and normal human tissue can be obtained *in vitro* in a medium composed of fowl plasma to which extract of the human tissue, or extract of chick embryo, has been added.

(b) The growth of epithelial cells differs from that of connective tissue cells. The former grow out in the form of buds or in a solid, advancing mass, whereas the latter radiate out in long, branching lines.

(c) The new growing cells are much larger than the original cells from which they grow. They also contain numerous highly refractile granules and are markedly amoeboid, and tend to throw out long, protoplasmic processes into the medium.

(d) The growing tissue tends to liquefy the medium, more especially the solid outgrowth of epithelial cell.

(e) Connective tissue would appear to grow more readily than specialized epithelial tissue.

(f) The growth of human and other mammalian tissue *in vitro* is much slower than that of embryonic chick tissue *in vitro*, but the former tissues continue to proliferate in the original medium for a longer time before degeneration occurs.

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Some Further Researches on the Cultivation of Tissues *in vitro.*

By DAVID THOMSON, M.B., Ch.B.Edin., D.P.H.Cantab.¹

Read before a Meeting of the Society on May 11, 1914.

The PRESIDENT, Sir FRANCIS H. CHAMPNEYS, Bt., M.D., in the Chair.

(I) TECHNIQUE.

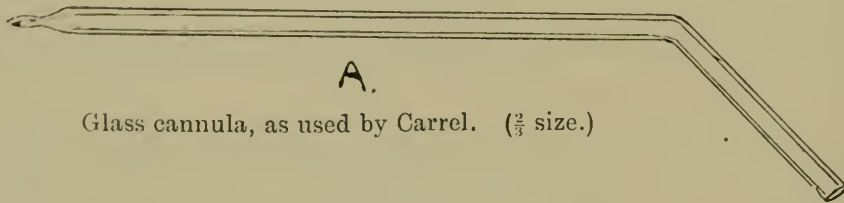
THE technique for the cultivation of tissues *in vitro* has been developed chiefly by Carrel, *vide* Carrel and Burrows (1911), Carrel (1912), Carrel and Ingebrigtsen (1912), Abderhalden (1912), Oppel (1912). Carrel works in a specially prepared aseptic room like an operating theatre with a staff of trained assistants, chiefly because he also carries on surgical work with regard to the grafting of organs. For ordinary tissue cultivation, however, I have been able to reduce the complications so that it can be successfully carried on in an ordinary laboratory with the help of one assistant. In fact, the work of tissue inoculation and subculture *in vitro* can be carried on almost as easily as any ordinary bacteriological work.

(a) *The Preparation of the Medium.*—The substances necessary for the medium are blood plasma, Ringer's solution, and tissue extract. So far as I can ascertain, it was generally believed that the tissue of a given animal can only be cultivated in a medium containing the blood

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plasma of that species of animal, but in the paper by my brother and myself which has just been read it is pointed out that the tissue of mammals, including man, may be successfully cultivated in fowl blood plasma. Mammalian blood plasma clots much more rapidly than fowl plasma, so the plasma of the latter is much the best for a general tissue culture medium, since it can be kept in a fluid condition for some months in an ice incubator.

(1) The fowl plasma is obtained in the following manner: Sterilize by dry heat about one dozen centrifugal tubes and immerse these in a vessel containing molten paraffin (52° hardness) in a dry heat sterilizer capable of maintaining a temperature of about 200° C. This is done in order to coat the tubes with a sterile layer of paraffin. The tubes are corked with sterile paraffin-coated corks and are then placed in a vessel in the ice incubator to cool them to about 0° C. It is now necessary to prepare for the bleeding of the fowl. A large quantity of blood can be



obtained by withdrawing it from one of the carotid arteries by inserting a glass cannula similar to that depicted in diagram A. About 60 c.c. of blood can be obtained without killing the fowl, and if it is allowed to bleed to death even more can be drained away. The cannula should be boiled in a solution of sodium citrate and kept in the vessel ready for use. The other materials required for this operation are ether for anæsthesia, a tin vessel containing cotton-wool for the anæsthetic mask, a board with four pegs for tying down the fowl, sterile scalpels, scissors, dissecting and clamping forceps, needles, silk thread or catgut, and some dilute antiseptic lotion with swabs, and also some sterile cloths or towels with which to cover up the animal, leaving a small open space for the operation on the neck. The animal is anæsthetized and then placed on its back on the board and its legs and wings are securely fastened to the four pegs. A block should be placed under the neck to keep it up. The feathers are plucked from the neck and the skin cleansed with antiseptic lotion, and the sterile towels are placed over

the animal, exposing only the prepared skin. An incision about 2 to 3 in. long is made a little to one side of the middle line and the tissues are separated until the carotid is found. A ligature is tied round the vessel at its distal end and another loose ligature is placed about $\frac{1}{2}$ in. proximal to this for the purpose of tying on the neck of the cannula when inserted into the vessel. Clamp the vessel proximal to the loose ligature, then make a small cut in the vessel (between the ligatures) with fine scissors. Insert the cannula and tie the loose ligature firmly around the neck of the former, release the clamp and allow the blood to flow into the paraffined and cooled centrifugal tubes. The fowl should not be anæsthetized too deeply, since no blood will be obtained if it dies from an overdose. If the carotid is ligatured proximally to the wound, and the skin stitched up, the fowl may live, and can be used again on a future occasion. The blood obtained in this way is rapidly centrifugalized to drive down the corpuscles and is then stored in the ice incubator. It is not necessary to pipette off the supernatant plasma and to transfer it to other tubes free from corpuscles.

(2) *Ringer's Solution*.—The following is the formula of the solution employed by Carrel: Distilled water, 1,000 c.c.; sodium chloride, 9 gm.; calcium chloride, 0.25 gm.; potassium chloride, 0.42 gm. It might be advisable to add sodium bicarbonate, 0.3 gm., since tissues while growing produce acid products (Rous, 1913).

(b) *Tissue Extract*.—Carrel (1913) has shown that tissues grow much more rapidly and profusely if certain extracts are added to the medium. He found that extract of chick embryo, extract of adult spleen, and Rous sarcoma extract, were most active in stimulating the growth of the connective tissue of an embryonic chick heart. Tissue extracts, of which, in my opinion embryonic chick extract is the best for all-round purposes, are prepared as follows: The embryonic chick (about eight days old) is removed from the egg with aseptic precautions and placed in a sterile watch-glass in a sterile Petri dish. Three to five drops of sterile Ringer's solution are added, and the embryo is then easily clipped up into an emulsion by means of a fine pair of sterile scissors (curved blades). The emulsion is transferred by a Wright's pipette with teat to a sterile tube, centrifugalized, and kept indefinitely in the ice incubator. The clear supernatant fluid is the extract used. Extracts of other tissues are made in a similar manner.

(c) *The Culture Preparations*.—I have found that very satisfactory aseptic results can be obtained by working on a polished oak table in a

clean laboratory. The room should be as free from dust as possible. The table is scrubbed with dilute lysol and the necessary apparatus placed upon it. The following apparatus is required: Petri dishes, some of these containing a watch-glass; closed vessels, of glass or metal, containing cataract knives, forceps and scissors with straight and curved blades; also a few all-metal needles (all the instruments should be as fine as possible); closed vessels (preferably large Petri dishes) containing cover-slips and special glass slides; a sloping rack on which are placed plugged test-tubes containing Wright's pipettes, one of which should be paraffined; a vessel containing rubber teats, a bottle of vaseline and a fine glass rod; a large test-tube of Ringer's solution; a vessel of melted paraffin (52° hardness), a brush, and a Bunsen burner, complete the outfit. All the apparatus should be sterilized and dry. I find a dry sterilizer most useful. The rubber teats should be boiled. The cover-slips necessary for this work should be 50 mm. long by 22 mm. broad. I prefer No. 1 slips, so that a high microscopic magnification may be used if necessary. The glass slides required measure about 3 in. long by 1 in. broad, and $\frac{1}{5}$ in. in thickness. They contain a hollow depression in the centre about 18 mm. in diameter and about 2 mm. deep. In other words, these slides are similar to those used for Widal work, but are thicker, so as to obtain a deeper hollow. In addition, it is advisable to have a few ordinary slides made of black glass. When all is ready the sterile Wright's pipettes should be fitted with sterile teats and replaced in the sterile test-tubes on the sloping rack. The paraffined pipette should be used for holding the fowl plasma. Other pipettes should contain Ringer's solution, and extract of chick embryo, and any other solution which may be desired for modifying the medium. Take a black glass slide and cover it with the lid of a Petri dish. Place on this a sterile cover-slip. A drop of fowl plasma is transferred to this cover-slip, and then the small portion of tissue, 1 mm. square or less, is transferred on the point of a needle or cataract knife into the plasma on the cover-slip. (The tissue is kept in Ringer's solution contained in the hollow slide before being cut to the required size and transferred to the medium.) A drop of chick embryo extract is then added to the drop of plasma and mixed and spread out with the point of the cataract knife. The addition of this extract causes the plasma to clot quickly and also improves the medium. When the plasma is clotted, take a glass slide and place a spot of vaseline on each side of the hollow depression, invert this over the cover-slip, which sticks by means of the vaseline. We

now have the tissue in a sterile hanging-drop medium. The cover-slip is hermetically sealed to the slide by painting melted paraffin around the margin of the former. Fig. 1, Plate I, illustrates the process just described. A black glass slide is used as a background for the cover-slip so that the small piece of whitish tissue can be seen more easily. One need not hurry unduly in the above technique, since the tissue in Ringer's solution can survive a considerable exposure to room temperature and still grow successfully. The influence of temperature and fluid medium on the survival of embryonic tissues *in vitro* has been investigated by Lambert (1913).

(c) *Transplantation or Subculture of Tissues.*—Carrel has subcultured tissue with great success. In his laboratory the same tissue has been subcultured for one and half years, having during that time undergone over 130 passages into fresh media. He recommends subculturing every two or three days for embryonic chick tissue. The tissues of adult mammals, including man (Thomson, D., and Thomson, J. G., 1914), however, grow much more slowly than embryonic chick tissue, so that in the case of the former it would be sufficient to subculture every eight to ten days. Carrel subcultures as follows: Remove the cover-slip from the culture preparation and cut out the piece of growing tissue from the medium and transfer it to sterile Ringer's solution in the hollowed-out slide. It is allowed to soak in this solution for about thirty seconds, and if it has markedly increased in size it should be divided before transferring it into the new medium. After the tissue has grown extensively, a yellowish necrotic area sometimes develops in the centre; this necrotic area should be removed before transplanting into the fresh medium.

(II) OBSERVATIONS ON THE GROWTH OF VARIOUS TISSUES IN VITRO.

The total number of culture preparations made in this research was 200. In very young chick embryos about four to eight days old, it is rather difficult to isolate different species of tissue, and at this early age the cells seem to be nearly always round cells. Fig. 2 shows a portion of embryonic chick tissue composed of round cells in which little growth has occurred. In the solid jelly-like medium, however, the growth which occurs is always of a branching nature, in which the new cells appear to be entirely different from the original cells. Thus cells which were originally small and round show an outgrowth of

EXPLANATION OF PLATES.

All the photographs were taken while the tissue was alive, except in figs. 13, 26, 27, 28, and 32, which were taken from stained permanent preparations.

PLATE I.

FIG. 1.—Illustrates the method of making a culture preparation. A, cataract knife used for cutting the tissue. D, Wright's pipette used for transferring culture medium to the cover-slip lying upon the black glass slide, B. Note the small piece of tissue (white) lying in the culture medium. C, thick glass slide with hollow depression, with two drops of vaseline on either side. The vaseline causes the cover-slip to adhere to the slide in the position required, and melted paraffin is then painted around the margin to hermetically seal the preparation. (About $\frac{1}{2}$ nat. size.)

FIG. 2.—A portion of embryonic chick tissue, with clean-cut edges, showing practically no growth, six days' incubation. Medium: Fowl plasma one part, extract of human papilloma of ovary one part. ($\times 75$.)

FIG. 3.—New growth from embryonic chick tissue, twenty-four hours' incubation. Note that the original consists of round cells, whereas the growth is composed of elongated branching cells. Medium: Fowl plasma one part, Ringer's two parts, extract of embryo one part. ($\times 66$.)

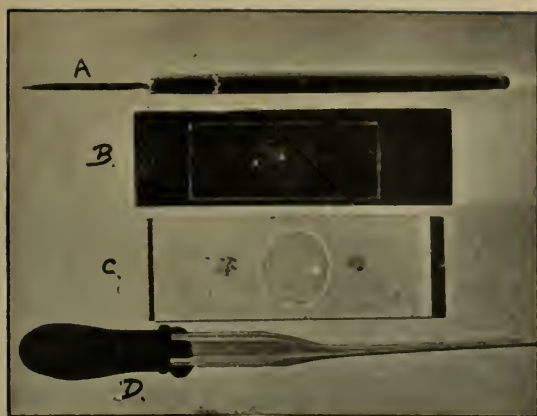
FIG. 4.—Same preparation as fig. 3, eight days' incubation. Showing bubble-like degenerative changes. ($\times 66$.)

FIG. 5.—Similar preparation, six days' incubation. Showing the highly refractile granules within the cells. ($\times 400$.)

FIG. 6.—Similar preparation, forty-eight hours' incubation. Shows the granular and branching character of the growing cells. ($\times 290$.)

PLATE I.

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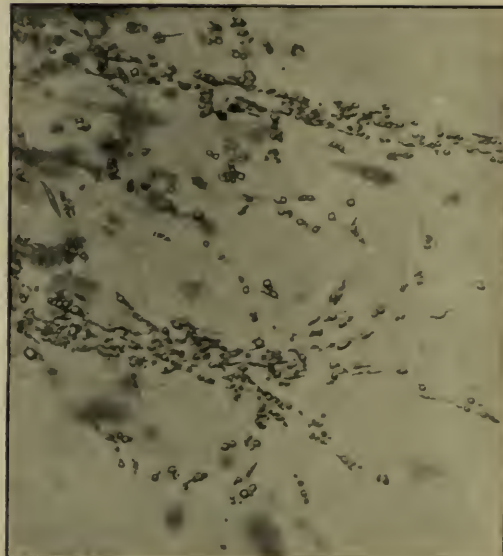
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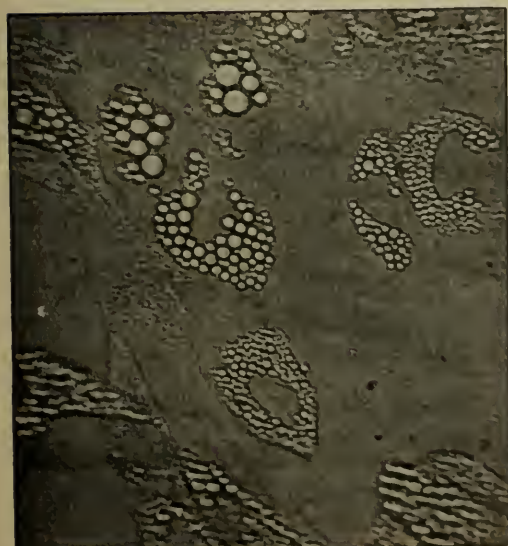
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large, elongated, branching cells filled with highly refractile granules (figs. 3, 4, 5 and 6). It may be maintained by some that these new cells are merely cells which have emigrated from the original tissue, but this is not the case. Carrel has proved beyond all doubt that this is real growth, since the same piece of tissue cultivated in this manner has grown for eighteen months and during that time has been divided and subdivided more than one hundred times (Ebeling, 1913). On one occasion the tissue augmented more than fifty times in six days (Carrel, 1913). No one who has actually watched the behaviour of tissue in culture can ever question the fact that true proliferation is occurring. The most puzzling phenomenon to my mind is the constant tendency of the growing cells to elongate and throw out processes. This tendency occurs not only with connective tissue but also in the case of epithelium.

Figs. 3 and 6 show the production of elongated branching cells from a mass composed apparently of round cells only. Figs. 7, 8, 9, and 10, Plate II, represent successive stages in the growth of a piece of epithelium from the leg of an embryonic chick, and again the new growing cells show a distinct tendency to elongate. Fig. 11 shows what appears to me to be an outgrowth of epithelial cells from the kidney of an adult rabbit. In the accompanying paper (Thomson, D., and Thomson, J. G., 1914) it has been shown, however, that in the case of human tumour tissue and normal human tissue the growth *in vitro* in plasmatic medium varies according to the nature of the tissue. The connective tissue branches very markedly, whereas the epithelium grows in the form of buds or in a solid advancing line, nevertheless the cells of the new growth of epithelium tend to be elongate and throughout long processes, whereas the original cells from which they have sprung are round with few or no processes. Fig. 12 shows a more or less compact extension of epithelial cells from a portion of chick embryo tissue, which again shows the tendency to elongation, especially at the growing margin.

Lambert and Hanes (1913) have shown that some growing tissue cells show different appearances due to the various different mechanical factors of the medium, and it appears to me that this remarkable difference between the original cells and the new cells which arise from these is due to a difference in the osmotic tension of their new surroundings. I have endeavoured therefore to vary the medium in order to see if different forms of cell proliferation could be produced in this way. Varying amounts of Ringer's solution and even distilled water

were added to the plasma basis, but so long as the medium clotted to form a solid jelly-like mass the new cells continued to show the tendency to elongate, as shown in figs. 13 and 14, Plate III. I then tried various fluid media, composed of (a) white of the egg from which the embryo was removed, plus extract of embryo; (b) ascitic fluid plus extract of embryo; (c) extract of embryo alone. In all cases where a fluid medium was employed, on inverting the cover-slip over the hollow in the slide the fluid ran towards the margin of the hollow, leaving an air-bubble in the centre, and the best growth or apparent growth always occurred in the thin layer of fluid medium which remained on the cover-slip in contact with the air of the bubble, while, on the other hand, no growth occurred from the tissue immersed in the ring of fluid medium around the air-bubble. Figs. 15 and 16 show this very clearly. Fig. 16 shows the remarkable extension or apparent growth which took place in the air-bubble from the original portions of tissue A and B, whereas the portions of tissue C, D and E in the ring of fluid medium around show no growth whatsoever. The fluid medium in this case consisted of fowl plasma one part, egg white one part, Ringer's solution two parts, and embryo extract one part. The solid advancing extension consisted entirely of round cells exactly like the cells of the implanted tissue. Fig. 17 shows a similar extension of round cells (higher magnification) in the air-bubble in a fluid medium composed of egg white one part plus embryo extract one part. In the fluid medium composed of ascitic fluid one part plus extract of embryo one part, and extract of embryo alone, a very slight extension of round cells occurred, with a slight tendency to branching in places where the medium had dried. Again, fig. 18 shows a solid extension of round cells (A) from the darker original portion of tissue, and beyond the margin of the round-cell extension the cells have commenced to branch (B). In this case the medium consisted of chick serum one part, chick plasma one part, plus extract of embryo one part. The tissue was lying in a thin layer of semi-fluid medium in the air-bubble. The medium separated into two layers—an inspissated solid layer next the glass of the cover-slip and a deeper fluid layer. The round-cell extension seen in the photograph occurred in the fluid layer, whereas the branching cells seen out of focus occurred in the solid layer. I have attempted therefore to prove that the cause of the branching phenomenon is the semi-solid or jelly consistence of the plasma medium, and that where the medium remains fluid the cells retain their original round shape. I will criticize these experiments,

PLATE II.

FIG. 7.—Piece of epithelium from leg of embryonic chick after six hours' incubation. Medium : Fowl plasma one part, Ringer's one part, extract of embryo one part. ($\times 115$.)

FIG. 8.—Same preparation after twenty-four hours' incubation. ($\times 115$.)

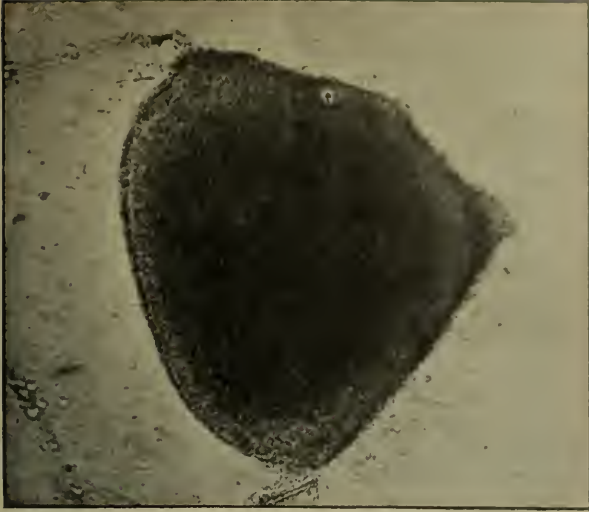
FIG. 9.—Same preparation after forty-eight hours' incubation. ($\times 115$.)

FIG. 10.—Same preparation after three days' incubation. ($\times 115$). N.B.—The tissue has grown beyond the limits of the photographic field.

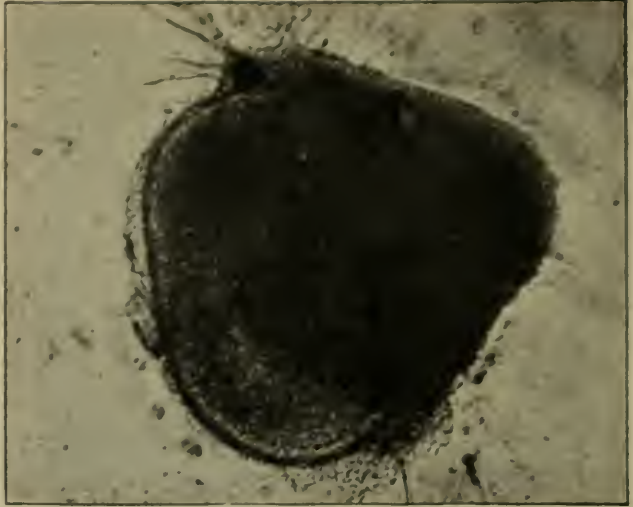
FIG. 11.—Shows outgrowth of new cells (epithelium?) from a piece of adult rabbit kidney, ten days' incubation. Medium : Fowl plasma one part, extract of chick embryo one part, extract of the kidney one part. ($\times 115$.)

FIG. 12.—Shows more or less solid advancing growth from a piece of epithelium of an embryonic chick, four days' incubation. Medium : Fowl plasma one part, extract of embryo one part. ($\times 66$.)

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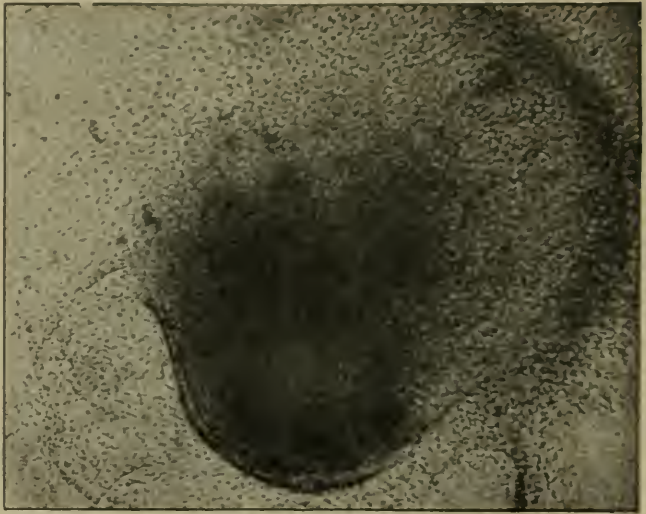
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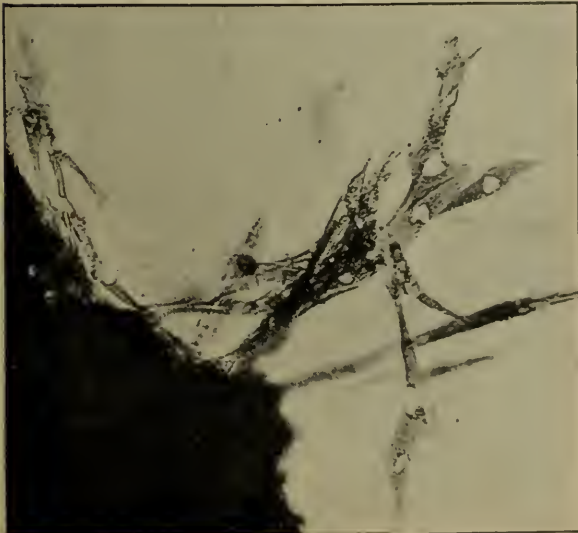
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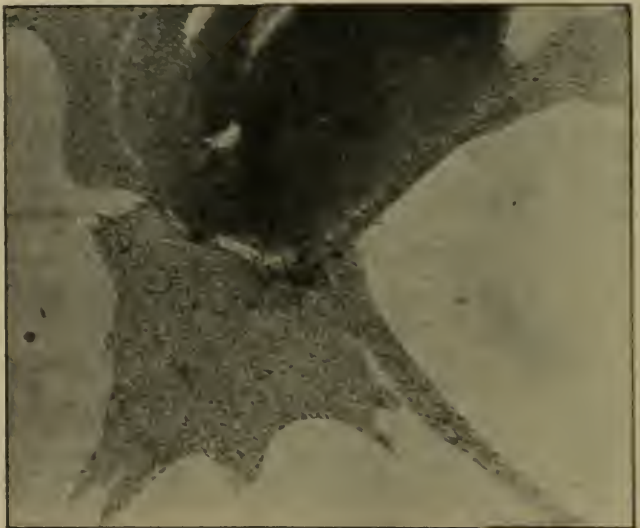


PLATE III.

FIG. 13.—Shows an extension of large branching cells which grew out from a pulsating heart of a chick embryo, tenth day of incubation. The heart continued to pulsate during the ten days, during which time it was transplanted three times into fresh medium. Medium: Fowl plasma one part, extract of brain of chick embryo one part. ($\times 66$.)

FIG. 14.—Shows a colony of new growth occurring from original central portion, fourth day of incubation. Medium: Fowl plasma one part, Ringer's one part, extract of embryo one part. ($\times 66$.)

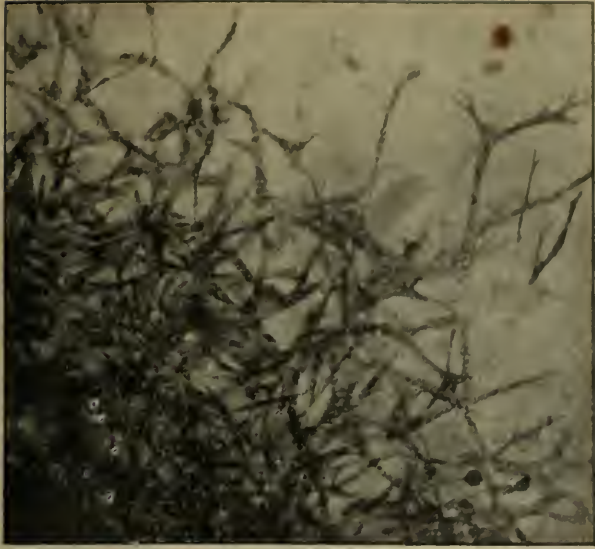
FIG. 15.—Shows absence of growth in liquid medium outside air-bubble, and apparently extensive growth in air-bubble from original portions of embryonic chick tissue, A and B. Medium: Fowl plasma one part, egg white one part, Ringer's two parts, embryo extract one part. ($\times 10$.)

FIG. 16.—Same specimen showing the full extent of the apparent growth from portions A and B, after five days' incubation. ($\times 10$.) N.B.—The new extension consisted of round cells similar to those of the original tissue.

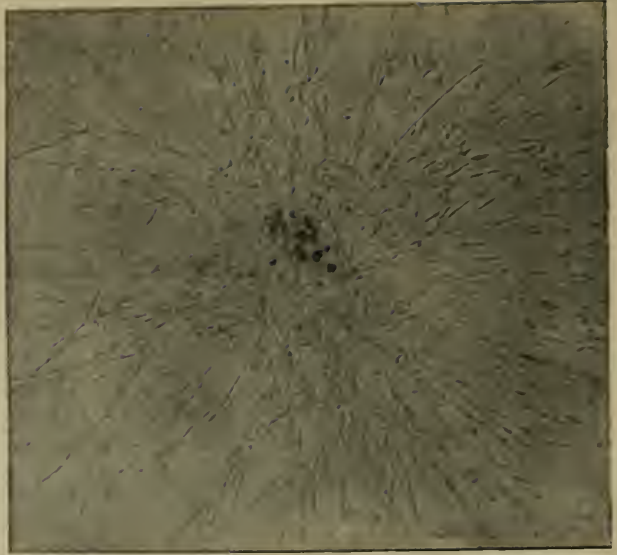
FIG. 17.—Shows extension of round cells from embryonic chick tissue in fluid medium (egg white one part, embryo extract one part) in air-bubble, after forty-eight hours' incubation. ($\times 290$.)

FIG. 18.—Shows two kinds of growth from original embryonic chick tissue: A, round-cell extension in fluid layer of the medium; B, branching cell extension in the solid layer of the medium, sixth day of incubation. Medium: Fowl plasma one part, fowl serum one part, extract of embryo one part. ($\times 66$.)

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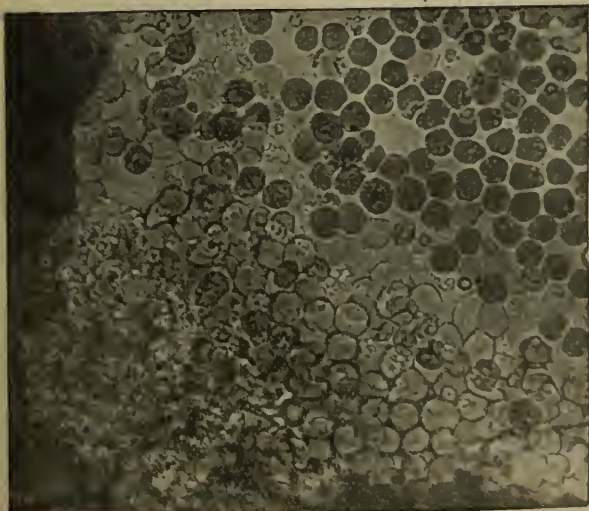
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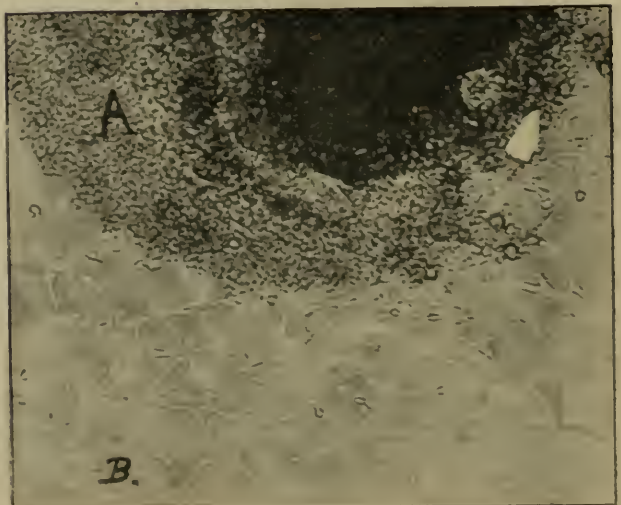
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however, in that it is difficult to be satisfied whether the extension of round cells in the fluid medium is really a true proliferation or simply an exudation of the original cells.

I wish now to call attention to the photographs on Plate IV, since these have some bearing on this subject. I attempted to grow portions of the embryonic chick *en bloc*, so to speak, in the jelly-like plasma medium. Fig. 19 shows a photomicrograph of the toe of an embryonic chick, nine days old, newly placed in a medium composed of fowl plasma one part, extract of embryo two parts. Fig. 20 is a photomicrograph of the same after eight days' incubation. Fig. 21 shows the tail-end of a chick embryo three days old (medium, fowl plasma one part, extract one part). Fig. 22 shows the same after forty-eight hours' incubation. Fig. 23 shows a complete embryo, two days old (medium, fowl plasma one part, extract one part). The heart in this embryo kept beating actively in the medium, and after two days the embryo was removed, washed, and placed in fresh medium. The heart continued to beat actively, and on the fourth day it was again placed in fresh medium; during this process, however, the embryo, which was very friable, broke into two portions and was discarded. Fig. 24 is a photomicrograph taken on the fourth day of incubation. The second series of photographs shows in all three cases a distinct total increase in size over the corresponding three cases of the first series (the magnification in the respective pairs is identical). From these experiments it would appear that a total somatic growth had been obtained *in vitro*, and it is very important to note that in these cases no outgrowth of branching cells took place as occurs when small pieces of the tissue are cut away. It would appear, therefore, that a branching outgrowth will not occur in these cases due either to some somatic control or to some intact basement membrane.¹ If, however, the continuity of the mass of tissue is injured by a cut or an abrasion then a growth of branching cell would quickly occur at the injured or abraded part. Thus, if an entire embryo be cut in two and placed in the medium, branching growth will only occur from the cut surface, and none will take place from the uninjured surface. It is highly probable that this branching growth represents exactly what occurs in a live animal which has received a wound. Plasma is first poured out; this solidifies, and the cells, which are free and exposed, branch into the plasma clot and heal the wound.

¹ It is interesting to note that malignant tumours have no basement membrane, and this is probably the reason why they grow without limit and control.

(III) THE GROWTH OF SPECIAL TISSUES.

(a) *Brain and Spinal Cord Tissue.*—The brain tissue of the embryonic chick grows readily *in vitro*. Branching cells, connective tissue (?) and long fibrils, axis cylinders, are produced. On one occasion a kind of plexus composed of long fibrils with ganglion-like swellings was produced. Excellent work in this subject has been done by Ingebrigtsen (1913); see also Harrison (1910) and Burrows (1911). On one occasion I attempted to cultivate brain tissue from a full-time human foetus; but no growth was obtained, most likely because the foetus had been dead for about twelve hours before the tissue was obtained.

(b) *Nerve-fibre and Ganglion Tissue.*—A piece of nerve (both ends cut) from a chick embryo placed in the usual medium showed no apparent extension of the axis cylinders, but there was a copious branching growth from the sheath, evidently connective tissue cells. See also Lewis and Lewis (1912) and Marinesco and Minea (1912).

(c) *Muscle Tissue.*—I have been unable so far to get a growth of true voluntary muscle-fibre cells. When a young embryonic chick heart is cultivated in the usual medium only branching cells are produced. These new cells are supposed to be connective tissue cells, since they have no resemblance to the original muscle cells. The young embryonic heart of the chick is composed of rounded cells. The heart continues to pulsate in the medium in spite of the fact that it becomes surrounded by a mass of growing branching cells. The cells of the new growth show no tendency to pulsate.

(d) *Connective Tissue.*—This species of tissue grows very readily in the form of long branching cells. It is very difficult to get specialized tissues entirely free from the former, so that all tissue growth is apt to be mixed, and it is often difficult to differentiate which are the special cells and which the connective tissue in the new proliferation. In some cases, however, the difference is quite distinct. I have noticed this difference most markedly in a piece of human cancer tissue cultivated in a medium composed of fowl plasma plus embryonic chick extract. In this case the connective tissue was the first to proliferate in the form of very long branching cells; later, the epithelial cancer cells grew out in buds or in the form of a solid advancing extension (Thomson, D., and Thomson, J. G., 1914). A considerable amount of work has been

PLATE IV.

FIG. 19.—Toe of embryonic chick immediately after its transference into medium composed of fowl plasma one part, embryo extract one part. ($\times 66$.)

FIG. 20.—Same preparation, eighth day of incubation. ($\times 66$.)

FIG. 21.—Tail of embryonic chick immediately after its transference into medium, fowl plasma one part, embryo extract one part. ($\times 66$.)

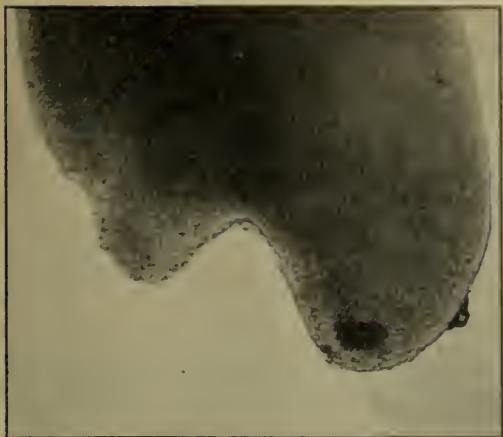
FIG. 22.—Same preparation, after forty-eight hours' incubation. ($\times 66$.)

FIG. 23.—Total embryo (two days hatched), twenty-four hours after it had been placed in medium, fowl plasma one part, embryo extract one part. ($\times 27$.)

FIG. 24.—The same preparation, after three days' incubation. (The embryo was transferred into fresh medium on the second day. Note the increase in size with the appearance of embryonic eyes. The heart continued to beat throughout.) ($\times 27$.)

PLATE IV.

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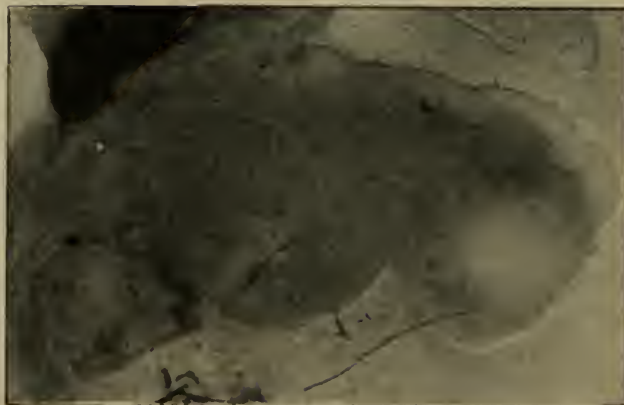
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done on the growth of connective tissue by several investigators: Carrel (1913), Ebeling (1913), Pozzi (1912), and Lambert (1912-13).

(e) *Skin Epithelium*.—Figs. 7, 8, 9, and 10 represent successive stages in the growth of a shaving of epithelium from the leg of an embryonic chick. The new cells show a definite tendency to elongate. I have attempted, without success, on one occasion to obtain growth from epithelial cells scraped from the human skin.

(f) *Growth from Embryonic Chick Feathers*.—If a young embryonic chick feather is cut and placed in the usual medium a definite cellular proliferation occurs at the cut end, composed of round and branching cells. The cut end becomes rounded and bulbous, and branching cells extend for some distance into the medium (figs. 29 to 32). If the feather be a black one, blackish branching cells, containing a varying amount of pigment, grow out from the cut end (fig. 32).

(g) *Liver*.—On two occasions I have attempted to cultivate the liver tissue of embryonic chicks about twelve days hatched, and each time an outgrowth of elongated cells occurred. Whether or not these were liver cells I am unable to state. They looked more like connective tissue cells.

(h) *Kidney*.—Fig. 11 shows an outgrowth of elongated cells from a portion of adult rabbit kidney in a medium composed of fowl plasma one part, plus extract of kidney one part, plus extract of chick embryo one part. The new cells in this case, though elongated, do not resemble the usual appearance of connective tissue proliferation, and I am inclined to look upon them as epithelial kidney cells. See also the works of Walton (1914) on this subject.

(i) *Bone*.—On the few occasions in which I have planted this tissue from the embryonic chick, in the usual medium, a proliferation of long branching cells, accompanied with considerable numbers of large rounded or oblong cells, was produced. The latter cells contained numerous large refractile granules.

(j) *Bone-marrow*.—The growth *in vitro* of this tissue is very interesting. It differs markedly from all other growths except that of the spleen. The tissue was obtained from the long bones of the leg of embryonic chicks from twelve to nineteen days hatched, and also from the long bones of hatched chicks fourteen days old. The growths in all cases resembled each other, more or less. The growth is not a branching proliferation, nor is it a solid extension. It differs from both in that it consists for the most part of isolated, active, amœboid

cells of varying shape (fig. 25). About the third day of incubation, however, long radiating lines of cells appear, which are probably true connective tissue cells. Leucocytes, chiefly of the polymorphonuclear type, are produced, and also red cells in abundance. Foot (1912-13) has studied the cultivation of this tissue very carefully, but, strange to say, he did not find any production of red cells.

(k) *Spleen*.—The proliferation of this tissue resembles that of bone-marrow very markedly. I have, however, cultivated only the spleen tissue of the embryonic chick, so that I am not in a position to state that the same type of growth occurs in the case of adult spleen tissue. Walton (1914) obtained a similar growth from adult rabbit spleen.

Fig. 27 is a photomicrograph representing a twenty-four hours' growth *in vitro*, and fig. 28 shows a higher magnification of the same after three days' incubation. The latter shows polymorphonuclear leucocytes, and other large mononucleated cells. The growth of this tissue has been studied very carefully by watching it continuously under the microscope, the preparation being kept at the necessary temperature by means of a warm stage, or by having the microscope in a special warm chamber. I am convinced that the extension of cells is not of the nature of a migration from the original piece of tissue, since I have seen the new cells themselves subdividing into several other cells. The first cells to grow out from the original tissue are apparently leucocyte-producing cells. Later, about the second or third day, there is a new proliferation of cells, which produce red corpuscles; large numbers of the latter are produced during the days following. On the third day long radiating lines of connective tissue cells appear, as in the case of the bone-marrow. It seems to me that there is little doubt that the embryonic spleen at least produces nearly all the elements of which blood is composed. Red marrow does not appear in the bones of the developing chick until about the twelfth day of hatching, so possibly the spleen is largely responsible for the blood produced some time before the marrow has developed. The red corpuscles are produced from large actively amoeboid cells, and when nearly fully developed they are discharged from these cells. At first the developing corpuscles are round, with large nucleus and bluish staining protoplasm, but gradually they become oval, while the nucleus becomes smaller and more compact, and a gradual transition from bluish to red occurs in the staining of the protoplasm around the nucleus. I hope, however, to give another paper devoted to this interesting process after a further study of the subject.

PLATE V.

FIG. 25.—Shows growth from bone-marrow of embryonic chick (nineteen days hatched), after three days' incubation. Medium: Fowl plasma one part, embryo extract one part. ($\times 110$.)

FIG. 26.—Same preparation, higher magnification, showing the production of polymorphonuclear leucocytes. ($\times 600$.)

FIG. 27.—Shows the growth from portion of spleen of an embryonic chick (nineteen days hatched), after twenty-four hours' incubation. Medium: Fowl plasma one part, embryo extract one part. ($\times 110$.)

FIG. 28.—Same preparation, higher magnification, after three days' incubation. Note the large round cells, and the production of polymorphonuclear leucocytes. ($\times 600$.)

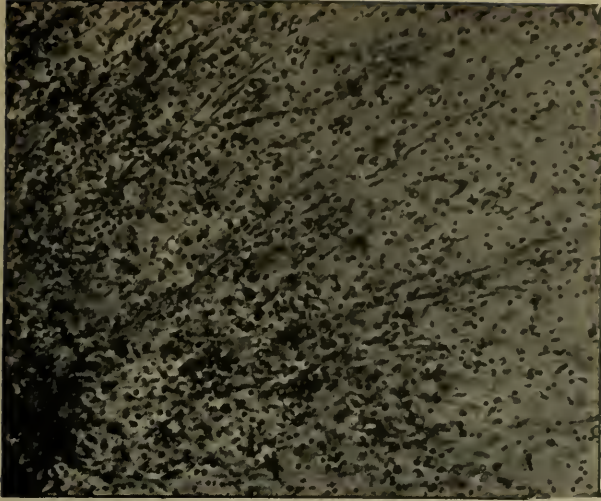
FIG. 29.—Appearance of cut end of feather of embryonic chick (fifteen days hatched) when placed in the medium. ($\times 66$.)

FIG. 30.—Appearance of cut end of similar feather, after three days' incubation in medium composed of fowl plasma one part, extract of human ovary one part. ($\times 66$.)

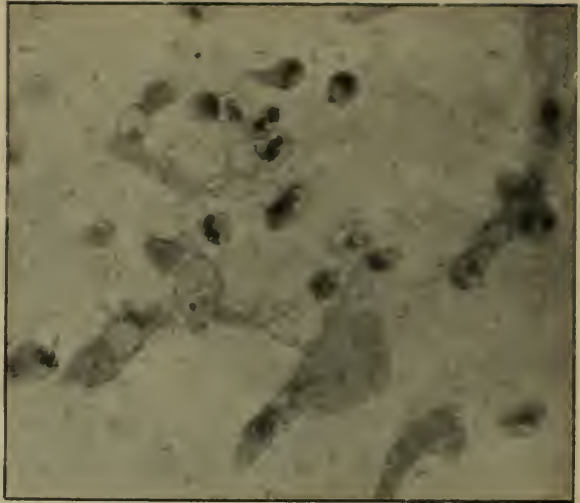
FIG. 31.—Identical preparation as last, after four days' incubation. Note the appearance of new sprouting cell. ($\times 66$.)

FIG. 32.—Illustrates the growth or healing process of cut end of feather of embryonic chick (eleven days hatched), after five days' incubation in a medium composed of fowl plasma one part, embryo extract one part. Note the formation of a large bulb at the cut end of the feather, also the new growing cells around. ($\times 66$.)

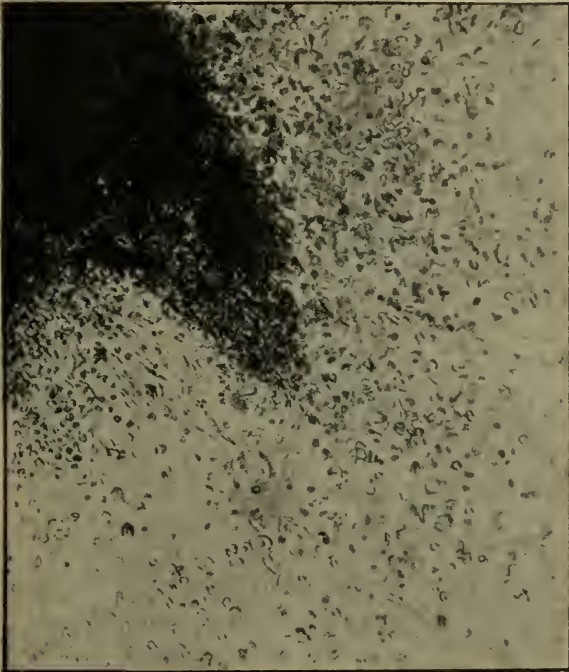
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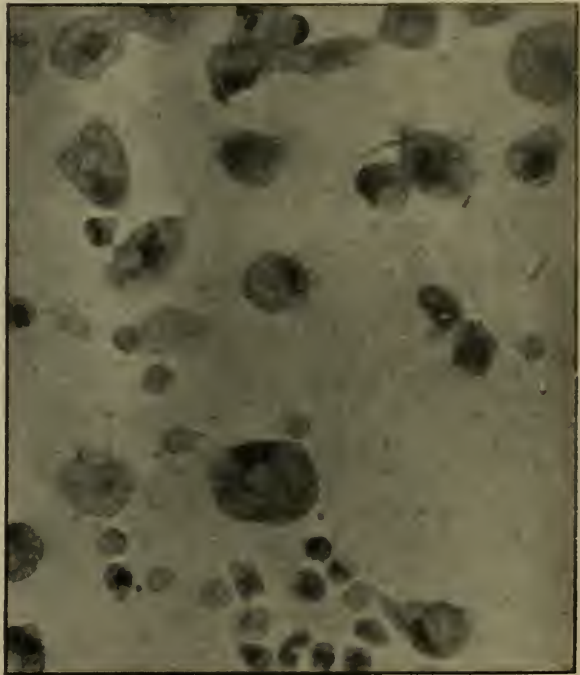
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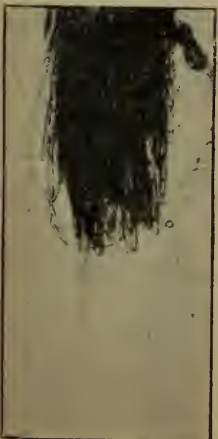
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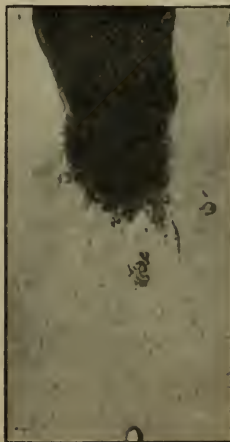
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(IV) FURTHER REMARKS.

I wish to say something on the effect of various tissue extracts when added to the medium. Carrel has shown that certain extracts when added to the medium increase the rate of growth in the tissue as much as tenfold and more. He believed that the effect of extract is specific, but this is not quite correct, as I have found that the extract of the tissue of one animal will help the growth of the tissue of an animal of quite a different species to the first. In fact, I obtained better growth from human cancer tissue in a medium composed of fowl plasma plus chick embryo extract, than in a medium containing fowl plasma plus extract of the cancer tissue itself. On the other hand, it would appear that certain extracts inhibit the growth of certain tissues. Thus, I failed to get any growth in chick embryo tissue in a fowl plasma medium containing extract of a human papillomatous tumour of the ovary. Again, no growth was obtained in fowl plasma to which extract of Rous sarcoma was added (fig. 1). In the accompanying paper (Thomson, D., and Thomson, J. G., 1914) it is pointed out that the stars of crystals resembling tyrosine crystals developed in the media to which extract of the papillomatous tumour of the human ovary was added. Similar crystals occasionally develop in media containing extract of chick embryo, so that it possibly represents the presence of a certain chemical substance in these extracts. Fowl plasma clots after being kept for some time at room temperature or in the incubator at blood heat. If extract of chick embryo is added to it, it clots very much more rapidly (one minute or less). Extracts of the tissues of other animals (mammals) do not appear to cause this rapid clotting effect in fowl plasma.

(V) SUMMARY AND CONCLUSIONS.

(1) The tissue of various animals, including mammals and man, can be cultivated *in vitro* in a medium composed of fowl plasma one part, plus extract of chicken embryo one part.

(2) It would appear that all proliferating cells tend to elongate and throw out processes in a solid plasma medium, whereas in a fluid medium they retain their original shape and appearance. The cells of different tissues, however, retain certain distinguishing characteristics in the plasma medium, so that these cells evidently have some inherent

points of difference from each other which remain with them regardless of the medium or environment.

(3) Complete uninjured portions of chick embryonic tissue grow to some extent *in vitro* under somatic control.

(4) The chick spleen in embryonic life at least is capable of producing red corpuscles as well as various forms of leucocytes.

(5) The extract of one species of animal tissue appears in certain cases to stimulate the growth of tissue from an animal of different species, whereas in other cases the converse seems to hold good.

(6) Extracts of certain tissues deposit stars of crystals resembling tyrosine when kept in the incubator for a period of two weeks and upwards.

ADDENDUM.

By permission of the President, at the conclusion of the foregoing report, Dr. H. D. McCULLOCH, demonstrated, by means of the kinematograph, cytogenesis and histogenesis in embryo chick's heart tissue and spleen tissue, including their accessory free cells, *in vitro*. Dr. McCulloch said:—

Last winter I suggested to Dr. David Thomson the importance of using the kinematograph in connexion with cytological research. On seeing the announcement of the reading of the extremely interesting report by Dr. J. G. Thomson, to which you have just listened, I thought this might be a good opportunity for again urging my plea before the Society. Having obtained the series of films from Dr. J. Comandon, of the Pasteur Institute, I decided to make an attempt to interpret some of the less conspicuous phenomena that are to be observed, and to indicate the direction in which further cytological research might with advantage be pursued. With your permission, and that of the author, I will proceed to do so. These tissues were photographed when several days old, after cultivation upon coagulated plasma by Harrison and Burrows's method, the same as is employed by Carrel.

The first series shows a fragment of the embryo chick's heart, in which energy is seen being expended by a continuance of the characteristic rhythmic contractions of that organ. How far do these contractions conduce to hypertrophy or growth of the muscle cells, and how far is the growth vegetative and embryonal? Again, there would

be some relationship, with a greater difference, between this growth *in vitro* and that observed in cells stimulated to activity by extrinsic chemical agencies that evoke protoplasmic irritability, and that which follows upon the influence on cells by the periodic hormonal secretions. There is also the field of radio-biological research, in which Mottram and Beckton have shown that the effect of radio-active agencies on nuclear activity is much more marked during mitosis than during the resting or vegetative periods of the cell.

The second series of films show a fragment of splenic tissue of the embryo chick, with its rudimentary Malpighian bodies and the cells which are presumably the progenitors of the blood cells encircling the fragment, in various stages of immaturity, and from which they appear to have emigrated within a certain radius of its centre. The majority of these cells are seen to be actively rotating and moving under some central influence, in the artificial conditions for which some allowance should be made. The two or three large germinal cells, like giant cells, might be detached Malpighian bodies moving to take up new situations in relation to the surrounding proliferation. The few mature leucocytes to be seen attract attention by their characteristic amoebism, and by the more active contortions when on the point of undergoing mitosis. The well-known nuclear phases of this process are, however, less clearly seen than when they are displayed in the metamorphosis of the newt's leucocyte or mononucleated white cell, into the far more inert nucleated red cell, during the erythrocytosis that follows upon high feeding.

In the next series, under still higher magnification of the cardiac tissue, marginal growth of the connective tissue stroma cells is seen to be proceeding. These cells appear as fixed radiating fusiform prolongations. In their cytoplasm small spherical granules are seen to stream to and fro in the direction of growth. The nuclei of these cells are obscured. Doubtless the absence of a capsule or limiting membrane influences the rate of peripheral proliferation.

In concluding these brief observations, seeing that the phenomenon of tactism in the impregnation of the ovum by spermatozoa has now been frequently demonstrated by this method, as well as that of the physiological mechanism of phagocytosis, the time seems opportune for inquiring into the origin and life-history of the leucocyte, the actual occurrence of diapedesis and its true significance. I refer to suggestions that I have ventured to make elsewhere—(1) that leucocytes are not essentially blood cells as generally accepted; (2) that polymorphism of

the nucleus is an indication of the extent of function, and is the result of the amœbic passage of these cells through variously dense tissue textures; (3) that the reason why the bone-marrow of adults is seen to be charged with masses of these polynuclear cells is not that they are generated in the myelin matrix as such, but that they are there for the purpose of undergoing secondary regeneration as mononuclear myelocytes. I submit that the lymphatic glands of the body are the primary source of mononuclear leucocytes. These are matters to which Dr. Comandon has kindly promised to give his earnest attention, but I see no reason why we should not be able to extend our researches in this direction, if facilities are afforded for carrying them out in this Marcus Beck Laboratory.

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The Royal Society of Medicine.

Marcus Beck Laboratory Reports.—No. 3.

Some Researches on Spirochætes occurring in the Alimentary Tract of Man and some of the Lower Animals.

By JOHN GORDON THOMSON, M.A., M.B., Ch.B.Edin.,¹ and
DAVID THOMSON, M.B., Ch.B.Edin., D.P.H.Cantab.²

Read before a Meeting of the Society on July 14, 1914.

The President, Sir FRANCIS H. CHAMPNEYS, Bt., M.D., in the Chair.

INTRODUCTION.

THIS research has been carried out in the Marcus Beck Laboratory of the Royal Society of Medicine under the directorship of Sir Ronald Ross, K.C.B., F.R.S. In this paper it is intended to confine the attention to the spirochætes which occur in the mouth and intestines of man and some of the lower animals in health, and in certain pathological conditions. When we consider the important part played by *Spirochætæ* and *Treponemat* in the production of serious diseases in animals and man all over the world, in this country and in the tropics, it seems difficult to realize that the commoner spirochætes of the human mouth and alimentary canal are almost entirely neglected by the research students and medical men in this country. The neglect

¹ Beit Memorial Research Fellow.

² Grocers' Research Scholar.

seems to be based on the assumption that these protozoa commonly occurring in apparently normal healthy individuals are in all probability harmless saprophytes. Although in our present communication we are unable to assign any real pathological importance to the spirochætes inhabiting the alimentary tract of man, it seems to us very important that these should be carefully studied. We have to thank Dr. H. B. Fantham and Dr. Annie Porter for the great assistance we have obtained in a difficult subject from the excellent work done by them in the study of the morphology of spirochætes. The bibliography given by Dr. Bosanquet in his book has been found to be very useful.

The help of the President, Sir Francis Champneys, the Secretary, Mr. MacAlister, and the Director, Sir Ronald Ross, in all matters connected with the Laboratory have made the work there most pleasant.

THE MATERIAL USED IN THIS RESEARCH.

The material used was obtained from various sources through the kindness of Dr. Keats, of Camberwell Infirmary. As practically every human mouth harbours spirochætes they were easily obtained, and a large number of cases of pyorrhœa alveolaris chiefly associated with chronic rheumatoid arthritis received particular attention. The fæces of several normal individuals as well as those of thirty chronic rheumatoid arthritis patients were studied. The pus from ulcerated throats, cancrum oris, cancer of the tongue, myositis ossificans of the jaw, and the fæces of a large number of guinea-pigs, rats, dogs, and fowls were carefully studied.

THE METHOD OF EXAMINATION.

The method employed is a very simple and rapid one. A thin film is made from the suspected material on a glass slide. This is fixed by heat. A concentrated alcoholic solution of gentian violet is prepared and used as a stock solution. For staining the slide we use one or two drops of the stock solution with each cubic centimetre of ordinary tap-water. We then pour this over the film previously fixed by heat, and heat gently. In a few minutes the spirochætes and treponemata are intensely stained and the slide is washed in tap-water and dried. This technique used in conjunction with the dark-ground illuminator enables one to study the spirochætes rapidly both in fresh and stained speci-

mens. Giemsa stain was also used after wet fixation of the film. When stained with gentian violet it has been noted that often darker stained areas of the bodies of the spirochætes are demonstrated, clearly suggesting granule formation.

NOMENCLATURE.

No subject is more confusing to the research student than the study of spirochætes. The immensity of the literature and the incomplete descriptions given by various authors at different times add to the difficulties. It is not intended here to enter into any discussion, but it is perfectly evident that many mistakes have been made by several investigators and new species have been named before there has been sufficient evidence for doing so.

Fantham (1911) says: "The spirochæte group as a whole (or various members of it) has received so many names that it seems to be a mania to rename it according to the individual fancy." Most protozoologists we feel sure agree with this statement.

The present state of our knowledge regarding spiral organisms enables us to distinguish three different genera.

(1) *Spirochæta*.—This protozoon has a flexible, wavy body with a corkscrew fin or flange which is called the membrane or crista. In the body there is a nucleus, consisting of a series of bars or rodlets ("granules") which is composed of chromatin. The formation of small ovoid bodies or spores which are resistant and capable of producing new spirochætes has been clearly proved by Fantham (1907, 1908, 1909, 1911) in his studies of the spirochætes of lamellibranchs, birds and mammals; Bosanquet (1911) also noted the formation of coccoid bodies in a preparation containing *Spirochæta anodontæ*.

(2) *Treponema*.—The bodies in these protozoa are extremely thin and are thrown into waves or coils which are said to be fixed or "preformed." There is no visible membrane and no visible nucleus. Balfour (1911), however, has recently stated that *Treponema pallidum* is a granule-shedder.

(3) *Spirillum*.—These are bacteria with a more or less flexible body. Flagella are present terminally and sometimes at the side. There is no membrane.

It would seem probable that the differences between *Spirochæta* and *Treponemata* may be merely a question of size, and that this explains the visibility of the membrane and nucleus in the *Treponemata*. That

there is a nucleus of a diffuse character in the *Treponema* seems certain, and the fact that Balfour has described granule-shedding in *Treponema pallidum* suggests that this organism may be really a member of the genus *Spirochæta*. We are aware that Zuelzer (1911) claims to have re-studied the type species, *Spirochæta plicatilis* Ehrenberg, and states that there is an axial rod therein. However, until further work on the subject has been done, we use the name "spirochætes" as above without prejudice. (Fantham, 1911.)

Spirillum as a name has been applied to many of the smaller spirochætes, but it is now recognized that this term should be applied only to bacteria with flexible bodies and flagella.

THE DIFFICULTY OF DISTINGUISHING VARIOUS SPECIES OF SPIROCHÆTES BY MORPHOLOGY.

There are three named species of spirochætes, which in many respects are very similar in appearance when examined under the dark-ground illuminator or in stained films; these are *Spirochæta buccalis* (Cohn, 1877), *Spirochæta refringens* (Schaudinn and Hoffmann, 1905), and *Spirochæta balanitidis* (von Prowazek and Hoffmann, 1906). The resemblance of *Spirochæta vincenti* (Blanchard, 1906) to *Spirochæta buccalis* is also said to be very close, and some observers think they are identical. Noguchi (1912) has pointed out that it is quite impossible to distinguish *Spirochæta buccalis* from *Spirochæta refringens* by morphological appearances, and again Rille (1905) and Kraus (1906) believed that *Spirochæta refringens* is the same as *Spirochæta balanitidis*. Other observers, Eitner (1907) and Richards and Hunt (1906), declare that at least four distinct varieties have been described indiscriminately as *Spirochæta refringens*. It is quite evident, therefore, that in this subject there is hopeless confusion. However, in order to escape this confusion, it is satisfactory enough for the time being to regard types like *Spirochæta refringens* and *Spirochæta balanitidis*, which are found in the mouth, as belonging to the species *Spirochæta buccalis*. This latter is a fairly broad spirochæte $\frac{1}{2} \mu$ to 1μ in breadth, which has tapering points and long shallow undulations. In length it varies from 12μ to 20μ , and under the dark-ground illuminator it seems to be flat or ribbon-shaped. It is an active spirochæte and has a corkscrew motion from left to right. Again, in many specimens stained by us we were able to see clearly a series of dark and light staining areas along the bodies suggesting granule formation (figs. 1 to 7 and figs. 14

to 17, Plate II). These figures show that the type varies and figs. 14 to 16 (Plate II) suggest a species corresponding to *Spirochæta refringens* or *Spirochæta balanitidis*.

In our opinion *Spirochæta vincenti* (or what we consider to be *Spirochæta vincenti*) can be recognized as different from *Spirochæta buccalis*, as it is a thinner spirochæte, not ribbon-like, and the coils are more irregular owing to the great flexibility of the body. This flexibility is well seen under the dark-ground illuminator. We have found it quite simple to select this species, both in stained films and also in living specimens. The figures 8 to 13, Plate II (*Spirochæta vincenti*), when carefully compared with the type *Spirochæta buccalis*, show a marked difference. Veszpremi (1907) described a spirochæte which he found in the abscess of the jaw, and he called this a new species—namely, *Spirochæta gracilis*. Bosanquet (1911) thinks this spirochæte is probably identical with *Spirochæta vincenti*. Recently the excellent work of Noguchi (1912), in which he has been able to isolate by cultivation methods three different species of treponemata from the human mouth, has demonstrated to us a new method of isolating and differentiating different varieties. These treponemata are all new species and have been named *Treponema macrodentium*, *Treponema microdentium*, and *Treponema mucosum* (Noguchi, 1912). These three new species were probably all included under the old name, *Spirochæta dentium* (Koch, 1877). Castellani (1906 and 1909) has described a form of hæmorrhagic bronchitis, occurring in tropical countries, and in association with this disease he has described four varieties of spirochætes—namely: (a) Very thick individuals 18 μ to 39 μ in length with irregular coils which vary in length but are not very numerous. (b) Individuals resembling *Spirochæta refringens* (Schaudinn) and possessing a few graceful curves and pointed extremities. (c) Thin, delicate spirochætes with numerous uniform coils and tapering ends. Sometimes one of the extremities is blunted. This is perhaps the commonest type. (d) Extremely thin, delicate organisms with very few irregularly shaped coils. Whether these are new species or not it is difficult to state, as it seems that they are very like in some respects certain of the types found in the mouth in other conditions. Castellani has described as a new species *Spirochæta subtilis*, an organism which he found in the scrapings of the oral mucosa and the intestines.

EXPLANATION OF PHOTOMICROGRAPHS (PLATE I).

All the slides were stained with an alcoholic solution of gentian violet.

Magnification is the same in all the photographs, and is 1,300 diameters.

FIG. 1.—Spirochæte from the fæces of a fowl.

FIG. 2.—Photomicrograph from a slide prepared from a severe case of pyorrhœa alveolaris. Note the large clumps of spirochætes and fusiform bacilli. The spirochætes belong to the type *Spirochæta vincenti*.

FIG. 3.—Photomicrograph from a slide prepared from a specimen of human fæces which had been kept for several months in a bottle with water. Two varieties of spirochæte will be noted, a short thick form, very similar in character to that shown in fig. 4, and another type, very thin and with very fine coils, one end of which is attached to a round piece of debris. Fig. 7 is another photograph of this thin variety, showing a longer specimen, but the fine coils are not seen.

FIG. 4.—Spirochætes in the human fæces showing the type called by Werner *Spirochæta eurygyrata*. These fæces were from an apparently normal human being. This type of spirochæte was found to be fairly common in the fæces of chronic rheumatoid arthritic cases.

FIG. 5.—Spirochætes from the fæces of an apparently normal human being showing the type described by Werner, and named *Spirochæta stenogyrata*. This seems very similar to the minute forms of *Treponema microdentium*. Very numerous spirochætes of this type were found in the fæces of a case of profound anæmia.

FIG. 6.—*Treponema microdentium* from a culture taken from the human mouth.

FIG. 7.—(See description under fig. 3.)

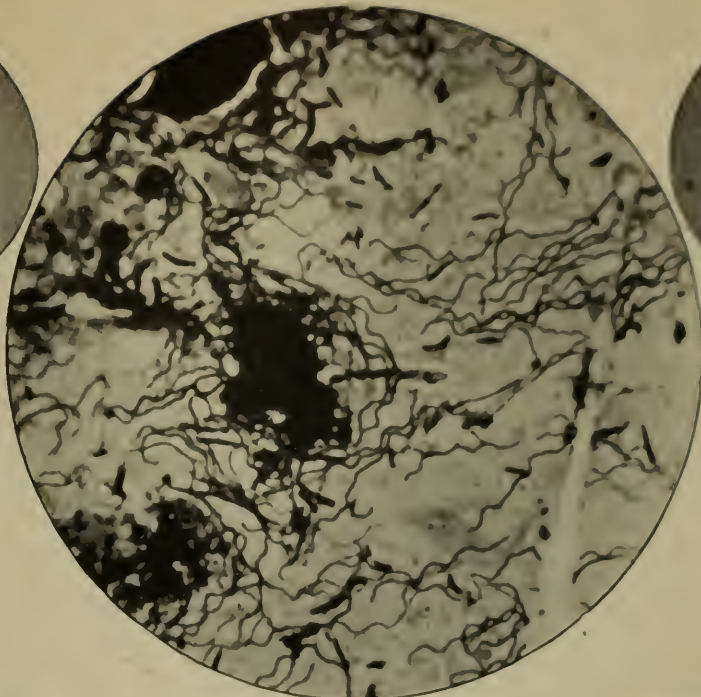
FIG. 8.—Photomicrograph taken from a preparation made from a case of Vincent's angina. The spirochætes vary greatly in size and thickness. At the upper margin two very long spirochætes with regular coils, other shorter spirochætes are seen, and some long, thin spirochætes with irregular coils. Fusiform bacilli are present.

FIG. 9.—Spirochæte from the fæces of a fowl (Plymouth Rock).

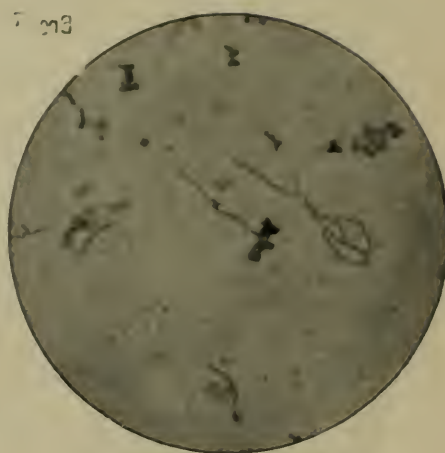
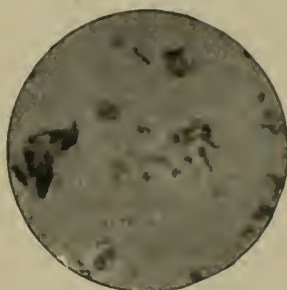
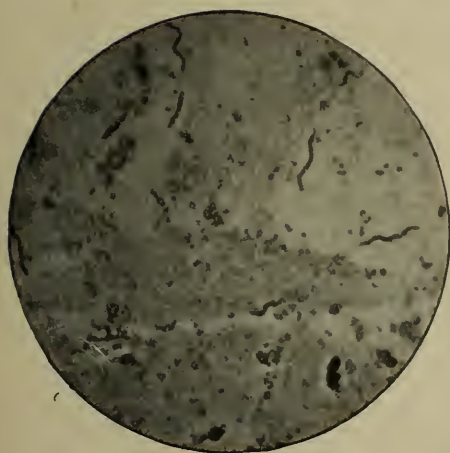
PLATE I.



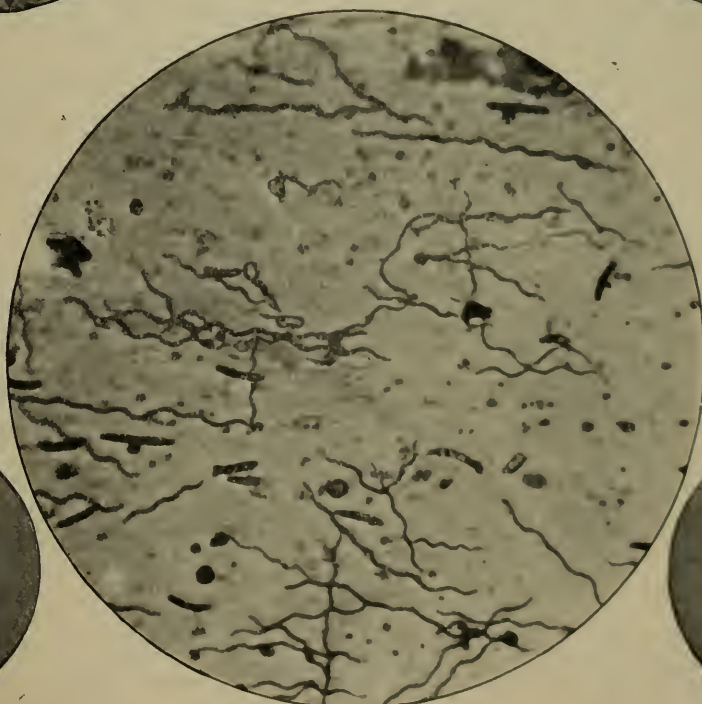
1



2



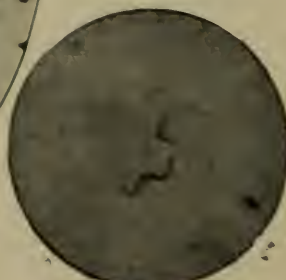
6



8



7



9

(D. Thomson, photo.)

Magnification = 1,300 diameters.

10 μ

AUTHORS' OBSERVATIONS ON SPIROCHÆTES OCCURRING IN
THE HUMAN MOUTH.

We have pointed out that, owing to the great variation in size and appearance of spirochætes belonging to a certain type, it is quite impossible by morphological characters alone to separate out new species, and as an example of this difficulty we have quoted the confusion that has arisen regarding *Spirochæta buccalis*, *Spirochæta refringens* and *Spirochæta balanitidis*. All these more or less resemble each other in being rather broad, ribbon-shaped organisms with tapering ends, wide coils and spiral movements, but they vary much in size and in the number of undulations. However, it is easy to separate out spirochætes in the mouth belonging to this general type, and we shall call these *Spirochæta buccalis* (figs. 1 to 7 and 14 to 17, Plate II). It is interesting to note that some of these when stained with an alcoholic solution of gentian violet in water showed a series of darker-stained areas in their bodies, strongly suggesting the formation of granules or coccoid bodies. We have not seen any previous mention of this in the literature on the subject (figs. 1 to 3, Plate II). Blanchard (1906) fixed the spirochæte found by Vincent (1898-99) as a new species, but unfortunately, as far as we can make out, he neglected to describe it. In our investigations, by careful examination of smears taken from ulcerations of the throat, cancrum oris, pyorrhœa alveolaris, &c., we have come to the conclusion that various types of spirochætes are associated with these conditions, and that they are all more or less associated with fusiform bacilli. Two varieties of large spirochætes are chiefly found—namely, a type corresponding to *Spirochæta buccalis*, and another distinct type which we may call the much discussed *Spirochæta vincenti* (figs. 13, 18 to 20, and 8 to 12, Plate II); also photomicrograph, fig. 2, Plate I). This type is quite definite. It is a long, thin spirochæte with wide, irregular coils, tapering at both ends, and in stained specimens it is noted that the coils are extremely irregular in size and shape and the bodies tend to curve round into different shapes owing to the extreme flexibility. Under the dark-ground illuminator it is to be noted that this type has a very flexible body, and the coils are not fixed. It is not band-shaped, but seems circular, and the movement is corkscrew in character (figs. 8 to 12, Plate II). These were derived from a case of Vincent's angina and were associated with fusiform bacilli. The photomicrograph (fig. 2, Plate I) shows similar spirochætes associated with fusiform bacilli from

a case of pyorrhœa alveolaris. The same type, *Spirochæta vincenti*, was found in a case of cancrum oris (fig. 13, Plate II) and in a case of abscess of the jaw complicating myositis ossificans (figs. 23 and 24, Plate II). Veszpremi (1907) described a spirochæte in an abscess of the jaw and he named it *Spirochæta gracilis*, but Bosanquet (1911) thinks this is identical with *Spirochæta vincenti*. Our drawings and observations would tend to prove this, but we must always guard against being definite about it, as Veszpremi may have been observing quite a different spirochæte. With respect to the confusion that has arisen by some observers considering *Spirochæta buccalis* as being the same as *Spirochæta vincenti*, we think this has probably arisen from their actually finding the type *Spirochæta buccalis* in Vincent's angina. The photomicrograph (fig. 8, Plate I) illustrates this very clearly. In this photograph from an ulcer of the fauces it will be noted there are numerous extremely large, thick, band-shaped organisms associated with fusiform bacilli (figs. 14 to 17, Plate II). From our studies, therefore, it seems quite clear that in ulcerations of the throat and severe pyorrhœas two types of spirochæte may occur separately or together—namely, *Spirochæta buccalis* (which may turn out to be composed of different species) and another type which we consider is *Spirochæta vincenti*. The fact that both these occur in certain definite pathological lesions seems to us clearly to explain the confusion that has arisen amongst different observers.

In specimens taken from the human mouth treponemata are common, and these greatly vary in size (figs. 25 to 27, Plate II). They have fixed coils and a rapid spiral movement. As pointed out by Noguchi, the only method of differentiating these is by cultivation.

Castellani (1906 and 1909) described a form of hæmorrhagic bronchitis occurring in the tropics and he found that this was associated with numerous spirochætes of different types. Branch (1907) in the West Indies and Jackson (1908) in the Philippine Islands also have described spirochætes associated with bronchitis. Recently Taylor (1914) has found spirochætes associated with bronchitis in Uganda; Chalmers, O'Farrell and Fantham (1913) have found them in bronchitic patients in the Sudan. Evidence is thus accumulating that these spirochætes are pathogenic in the tropics and give rise to severe bronchial symptoms.

EXPLANATION OF PLATE II.

All slides were stained with alcoholic solution of gentian violet.

Drawn with aid of camera lucida. Magnification = 1,500 diameters.

FIGS. 1 to 7.—*Spirochæta buccalis* from cases of severe pyorrhœa alveolaris of human mouth. Note figs. 1 to 3 show the dark-stained areas suggestive of granules.

FIGS. 8 to 12.—*Spirochæta vincenti* from cases of Vincent's angina associated with fusiform bacilli.

FIG. 13.—*Spirochæta vincenti* from a case of cancrum oris.

FIGS. 14 to 16.—These spirochætes were drawn from a case of Vincent's angina, and the type suggests that they are different from either *Spirochæta buccalis* or *Spirochæta vincenti*. In certain respects they resemble *Spirochæta refringens*.

FIG. 17.—*Spirochæta buccalis* from ulcer of throat.

FIGS. 18 to 20.—*Spirochæta vincenti* from cases of pyorrhœa alveolaris associated with chronic rheumatoid arthritis.

FIGS. 21 and 22.—*Spirochæta buccalis* from cases of pyorrhœa alveolaris associated with chronic rheumatoid arthritis.

FIGS. 23 and 24.—*Spirochæta vincenti* from a case of abscess of the jaw complicating a case of myositis ossificans.

FIGS. 25 and 26.—*Treponema microdentium* from pyorrhœa alveolaris.

FIG. 27.—*Treponema macrodentium*.

FIGS. 28 to 32.—Types of treponema found in cultures prepared from a case of pyorrhœa alveolaris.

FIGS. 33 to 35.—Spirochætes from apparently normal human fæces which clearly resemble the *Spirochæta stenogyrate* described by Werner. Compare figs. 75 and 76.

FIGS. 36 to 38.—Spirochætes found in normal human fæces, and also in cases of chronic rheumatoid arthritis which correspond to the type of *Spirochæta eurygyrate* described by Werner. Compare these with figs. 73 and 74 as depicted by Werner.

FIGS. 39 to 43.—New species of treponema hitherto undescribed. This was found in an old specimen of human fæces kept in a bottle at room temperature. Fig. 42 shows only a straight line. Figs. 42 and 43 show organism attached at one end to a rounded body.

FIG. 44.—Another variety of spirochæte, short and thick, with pointed ends. This was found in the same specimen of fæces kept in a bottle.

FIGS. 45 and 46.—Spirochætes found in the stool of an amœbic dysentery. Note these are larger and have irregular coils. These also tended to be blunted at the ends.

FIGS. 47 to 50.—Variety of spirochæte found in the fæces of guinea-pigs. Note the dark-stained areas in some suggesting granules.

FIGS. 51 and 52.—Another variety of spirochæte from the fæces of a guinea-pig. Note the dark-stained granules.

FIGS. 53 to 55.—Spirochætes from fæces of a dog, which was suffering from *Babesia canis*.

FIGS. 56 and 57.—Spirochætes from fæces of a rat.

FIGS. 58 to 61.—Spirochætes from fæces of a hen.

FIGS. 62 to 64.—Spirochætes from bronchitic sputum.

FIG. 65.—*Treponema pallidum* from a congenital syphilitic liver.

FIG. 66.—*Treponema microdentium* in culture to show the striking resemblance to *Treponema pallidum*. It would be impossible in this case to tell this from *Treponema pallidum* from morphological appearance only.

FIG. 67.—Spirochæte from a culture, probably *Spirochæta vincenti*.

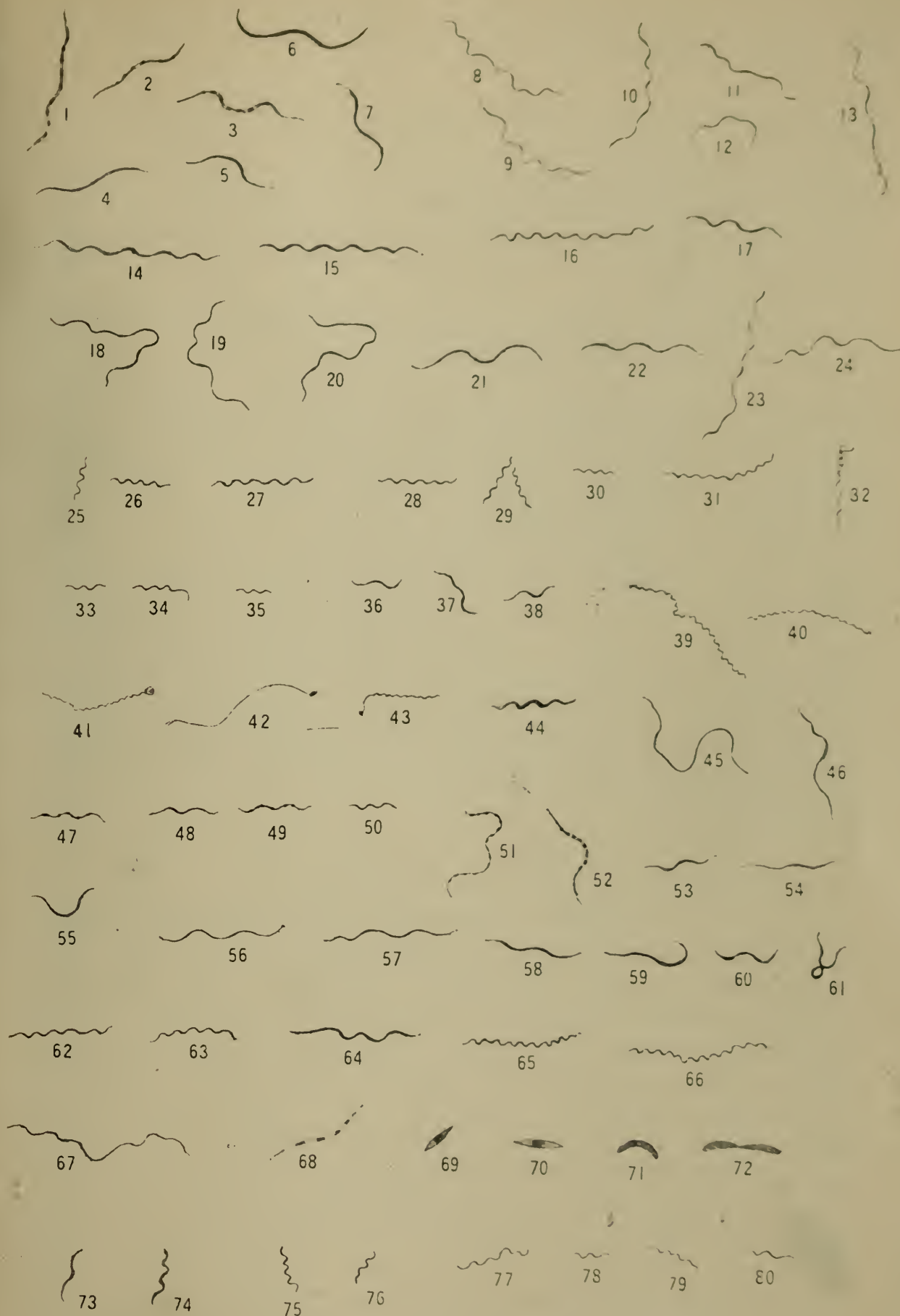
FIG. 68.—A cladothrix sometimes associated with *Spirochæta vincenti* in the mouth.

FIGS. 69 to 72.—Fusiform bacilli from the mouths of patients often associated with Vincent's angina, and also with severe pyorrhœa.

FIGS. 73 to 76.—Copies of the spirochætes as depicted by Werner. These are given to show the striking resemblance to those found by the authors in normal human fæces.

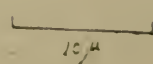
FIGS. 77 to 80.—Various spirochætes found in the fæces from a case affected with profound anæmia.

PLATE II.



J. G. Thomson. del.

Magnification - 1200 diameters



SPIROCHÆTES FOUND BY VARIOUS OBSERVERS IN THE HUMAN FÆCES.

Werner (1909) described two species of spirochætes which he found in his own fæces at a time during which he was apparently in normal health. He named these respectively *Spirochæta eurygyrata* and *Spirochæta stenogyrata*. This investigator thought that these might be fairly common in others. *Spirochæta eurygyrata* measured 4.6μ to 7.3μ in length, with usually two curves, and the body was very flexible (figs. 73 to 74, Plate II). *Spirochæta stenogyrata* measured 3.5μ to 6.1μ long, with two to six curves, and was less flexible. Werner found both these in a case of sprue. Le Dantec (1903) described the occurrence of spirochætes in a case of dysentery which he named "dysentérie spirillaire" to distinguish it from an amœbic dysentery. He describes three forms: (a) An undulating form with three curves and 6μ to 14μ in length; (b) a form curled round and forming a circle; (c) a form rolled up like a spiral. In the stools he found these in great numbers in the mucus. It will be noted that the spirochæte is much larger than that described by Werner. Kowalski (1894) described a spirochæte in the stools of cholera patients, and he named it *Spirochæta hachaizæ*. This spirochæte had two or three curls and pointed ends, and is perhaps identical with the *Spirochæta stenogyrata* described by Werner. Castellani has described a spirochæte which he found in the intestines as *Spirochæta subtilis*.

SPIROCHÆTES FOUND BY THE AUTHORS IN HUMAN FÆCES.

Numerous examinations of the fæces of both normal and diseased human beings show that both the species described by Werner occur in the fæces of a certain proportion of individuals. In two apparently normal individuals examined by us spirochætes of both types occurred in very large numbers in the stools. The photomicrographs figs. 4 and 5 illustrate these two species. Fig. 4 is *Spirochæta eurygyrata* and fig. 5 is *Spirochæta stenogyrata*. Figs. 36 to 38, Plate II, also illustrate these. These spirochætes persisted in large numbers for several days and then finally disappeared. The fæces in an obscure case of profound anæmia contained very numerous spirochætes of the type *Spirochæta stenogyrata*. In the fæces of about 50 per cent. of cases of chronic rheumatoid arthritis which we examined, spirochætes were found which corresponded to the type *Spirochæta eurygyrata* (figs. 36 to 38, Plate II). These were never very numerous in the specimens examined.

In a case of amœbic dysentery we found a much larger spirochæte with irregular coils, which varied in length from $8\ \mu$ to $20\ \mu$ and which seems to correspond to a certain extent to the type described by Le Dantec (figs. 45 and 46). This is a large spirochæte with ends rather blunted, and large irregular curves showing great flexibility of the body. This certainly is quite a different species to those described by Werner.

A NEW VARIETY OF TREPONEMA FOUND IN AN OLD SPECIMEN
OF HUMAN FÆCES.

A specimen of human fæces from an unknown source, after being kept in a bottle with some tap-water for several months, was found to contain active living specimens of two different kinds of spiral organisms. One form was a short, thick spirochæte with pointed extremities and two or three regular curves (fig. 1, Plate I, and fig. 44, Plate II). This spirochæte when compared with those described by Werner seems to be somewhat different, the coils tending to be deeper and slightly narrower as well as more regular.

The treponema was a very long and very fine spiral organism with extremely minute coils, so minute that we have failed to obtain a satisfactory photograph. This organism measured in length $10\ \mu$, $15\ \mu$ and $20\ \mu$ or more, and there were twenty or more minute regular waves well seen in deeply stained specimens. These were drawn by the aid of the camera lucida, and several drawings are given (figs. 39 to 43, Plate II). It will be noted that in many cases the appearance of the organism in stained specimens was a straight line (fig. 42, Plate II), and it often happened that one end was attached to a round body. Under the dark-ground illuminator the motion of these was extremely rapid and was corkscrew-like in character. The minute coils were fixed. This seems to be quite a new variety of treponema which, so far, we have not seen described. It is one of the finest spiral organisms we have seen, and is certainly too thin to measure with accuracy. What the source of this protozoon was we are unfortunately unable to state. We have been unable to find them in stagnant water, and so far we have not again found them in other old specimens of human fæces kept in similar conditions. We regret we do not know why the fæces were kept or who the patient was. Specimens of fæces are being kept under similar conditions, but we shall be unable to state definitely whether these can again be found until several months have elapsed. It is curious that these spirochætes continued to live and multiply for weeks

in the original bottle, but we were quite unable to get them to live in any other medium. That this is a new species of treponema we feel quite sure, but at present it seems unwise to name it.

SPIROCHÆTES FOUND BY VARIOUS OBSERVERS IN THE FÆCES OF LOWER ANIMALS.

Here a very wide field of research is open, and we must apologize for giving our attention to only a few animals commonly kept in the laboratory. We give so far as we are able a list of spirochætes found at different times in the intestines of animals.

Spirochætes in the gastric ulcers of a fox (Sambon).

Spirochætes in alimentary tract of cats, rats and dogs (Bizzozero and Salomon, 1896).

Spirilla in the intestines of pigs (Smith, 1894).

Spirochætes in the intestines of dogs and monkeys infected with trypanosomes (Balfour).

Spirochætes in the intestines of normal mice (Wenyon).

Spirochætes in the intestines of birds (Kent).

Spirochæta lovati, cæcum of a grouse (Fantham).

Spirochæta bufonis, intestine of a frog (Dobell).

Spirochæta of lamellibranchs—e.g., *Spirochæta balbianii*, *Spirochæta anodontæ*, *Spirochæta solenis* (Fantham), and *Spirochæta mytili* (Porter).

Spirochætes in the alimentary tract of insects—e.g., *Spirochæta glossinæ*, stomach of tsetse-flies (Novy and Knapp, 1906); *Spirochæta culicis*, in the gut and Malpighian tubules of *Culex pipiens*, and the larvæ of *Anopheles maculipennis* (Jaffé, 1907); *Spirochæta minei*, in the stomach of soldier and worker ants (Prowazek, 1910).

It is evident from this list that spirochætes occur in the intestines of most animals.

SPIROCHÆTE FOUND BY THE AUTHORS IN THE FÆCES OF GUINEA-PIGS.

While one of us was engaged in a research on *Trypanosoma rhodesiense* in the blood of guinea-pigs a blood-film stained by Giemsa's method was found to be filled with spirochætes. Several films were immediately prepared from the same animal and no spirochætes could be found. That the first film was simply a contamination was, there-

fore, perfectly obvious, and a search was accordingly made to find what was the source of these spirochætes. This accidental contamination of a blood-film with spirochætes shows the importance of being careful, as it might easily have been concluded that this was a new species of spirochæte infesting the blood of a guinea-pig. In this case the spirochæte was evidently from the mouth or intestines of a guinea-pig, as we have found them occurring in these animals.

Two varieties of spirochætes were found in the fæces of guinea-pigs. As no account of a spirochæte in the fæces of these animals has been given a full description of these seems necessary. The first variety is a small spirochæte with well-formed, regular, fixed coils and pointed at both ends. It measured from $3.75\ \mu$ to $7\ \mu$ as a maximum, but is usually about $5.5\ \mu$ in length and the waves are about three in number. When stained with gentian violet a series of little dark-staining granules may be seen suggesting a diffuse nucleus or the formation of granules (figs. 47 and 49, Plate II). These are not always seen, but in a great many slides they were beautifully demonstrated, as many as six dark-stained bodies being present. Under the dark-ground illuminator the motion of these is like a corkscrew, the rotation being from left to right. This is the commonest species of spirochæte found in the fæces of a guinea-pig. It occurred in a large percentage of normal guinea-pigs, usually in small numbers, but in the cæcum of several guinea-pigs which died of tuberculosis and trypanosomiasis it was found in very large numbers, so that it seemed that in conditions in which the health of the animal was affected and the vitality lowered this spirochæte was able to flourish in greater abundance.

The other variety of spirochæte found in the fæces of a guinea-pig was only found on one occasion in an animal which suffered from diarrhœa. This was a larger spirochæte, measuring from $10\ \mu$ to $14\ \mu$ in length, with large, irregular coils usually about two in number. The ends tapered to a point. In this case the coils were not fixed, and motion was more snake-like, but the movement also was spiral in character. Here again when successfully stained with gentian violet a series of dark-stained areas were distinctly seen lying close to one another, as many as twenty of these being counted in one spirochæte (figs. 51 to 52, Plate II).

SPIROCHÆTES IN THE FÆCES OF WILD RATS.

Salomon found spirilla in the intestines of dogs, cats and rats, and described three different varieties. The form found by us does not seem to correspond to any of those described by that observer, but of course several other varieties must exist in all probability in rats. The form found by us in the fæces of several wild rats caught in the Liverpool docks varied from 7μ to 10μ in length. The body was thin and tapered to a point at each end. The waves were flattened and irregular, and not fixed. In this case we did not see any differentiation in the staining of the body and no dark granules were seen (figs. 56 and 57, Plate II). In examining the fæces of animals it is necessary to be careful not to mistake flagella of *Trichomonas intestinalis* for spirochætes.

SPIROCHÆTES IN THE FÆCES OF A DOG.

In the fæces of a terrier infected with *Piroplasma canis* a short, thick spirochæte with tapering ends was found. They had only one or two curls, flat in character, and measured in length from 4μ to 9μ . They were actively motile with flexible bodies and exhibited spiral movements (figs. 53 to 55, Plate II). The organisms described by Bizzozero in the dog were 3μ to 8μ long and had three to seven waves.

SPIROCHÆTES IN THE FÆCES OF A HEN (PLYMOUTH ROCK).

This is a thick spirochæte with tapering ends and flat curves, usually about two in number. They vary in length from 5μ to 10μ . The curves are wide and flat and vary from two to four in number. Under the dark-ground illuminator these are seen to move actively with a spiral motion. Kent described spirochætes in the intestines of birds, and it is probable that they are common in the alimentary tract of most fowls (figs. 58 to 61, Plate II). It will be noted that in these the body is flexible and that the spirochæte may become twisted on itself. The photomicrograph (fig. 9, Plate I) illustrates this type of spirochæte very well.

THE CULTIVATION OF SPIROCHÆTES OF THE MOUTH.

After the splendid and laborious work of Noguchi (1912) in the cultivation of spirochætes we feel inclined to apologize for having obtained very indifferent results in our experiments. In no case were we able to grow a pure culture, and the types of spirochætes which seemed to grow most easily by the methods we adopted were the *Treponema microdentium* and probably *Treponema mucosum*.

Method.

About 1 in. of pure sterile human ascitic fluid is put into a small test-tube. This is inoculated with a loopful of material from a case of pyorrhœa alveolaris. The tube is closed with a sterile cotton-wool plug and the top rendered air-tight by means of a thin coating of ordinary sealing wax. This is incubated at 37° C., and in about seven to ten days it will be noticed that there is a white deposit in the bottom of the test-tube. In this culture it is found that the spirochætes have multiplied to a great extent in the fluid and that they are growing in symbiosis with numerous other organisms. Examination under the dark-ground illuminator shows, if the culture is successful, numerous active small treponemata. Noguchi has cultivated these in fluid media and afterwards isolated them in pure cultures in solid media by using anaerobic precautions. No strict anaerobiosis was used by us, but since the tube is sealed, and various cocci and bacteria are growing in the tube, it is to be assumed that in a very short time all the available oxygen is used up and so the treponemata find favourable anaerobic conditions. We give a photomicrograph taken from a subculture and this shows the clumps of small treponemata. We have managed many times by this method to obtain impure cultures of treponema, and we have thought it probable that by this method a very good mixed vaccine might be obtained which might be useful in cases of pyorrhœa alveolaris. The bacteriology of pyorrhœa is very imperfectly known and hence the real cause is unknown. This failure in the bacteriology of pyorrhœa seems to be based on the fact that the cultural methods are insufficient for the isolation and growth of all the numerous varieties of organisms in the alveolar margins of the mouth. Noguchi has isolated in pure cultures from the human mouth *Treponema macrodentium*, *Treponema microdentium* and *Treponema mucosum*, and Ellermann (1904), Weaver and Tunnicliffe (1905), Mühlens (1906), have

obtained the spirochætes of Vincent's angina and the fusiform bacilli in pure cultures; but so far the real pathological cause of pyorrhœa alveolaris is unknown, and it is still considered by many that it is really a result of the condition known as the uric acid diathesis. By the cultural methods so well begun by Noguchi it will be possible in the future to study the toxins and their effects, and so the real explanation of many obscure pathological conditions may be explained.

SOME REMARKS ON THE PATHOLOGICAL SIGNIFICANCE OF SPIROCHÆTÆ AND TREPONEMATA.

Spirochætes, according to Fantham, give a good example of the gradual adaptation to parasitism. In the early stages of their existence these organisms lived in water. From there they gradually found their way into the alimentary tract of the lower and higher animals, and finally certain varieties became so altered as to be capable of living in the tissues and blood-stream of the higher animals. Whether these parasites are of pathological importance when inhabiting the intestines and oral cavities of human beings apparently enjoying good health is doubtful, but when ulceration or abscesses form in these sites, as seen in pyorrhœa alveolaris, cancrum oris, abscesses of the jaw and Vincent's angina, they undoubtedly seem to seize the opportunity for proliferation and increase to such an enormous extent in numbers that they must produce toxins detrimental to the health of the host.

Do these spirochætes of the mouth and intestine remain in the superficial sites made suitable for them or do they finally find their way into the deeper tissues and ultimately into the blood-stream? That the *Treponema pallidum* is capable of proceeding from a superficial abrasion of the skin to the deeper tissues, and finally to every part of the human body, is well known. With their extremely thin bodies, sharp-pointed extremities, rigid, corkscrew-shaped coils and active spiral movements these are peculiarly adapted for making rapid progress in fairly dense media. It is by applying this knowledge of the active movement of these protozoa through a solid medium that Noguchi (1912) has been able to isolate *Treponema macrodentium*, *Treponema microdentium* and *Treponema mucosum* in pure cultures.

There is some cause for anxiety, therefore, when it is considered that perhaps a very narrow line of defence keeps the apparently harmless treponema of the human mouth and intestines from proceeding into the general system. Moritz found spirochætes from $2\ \mu$ to $6\ \mu$ in length

and with from three to ten coils in the wall of the gut and also in the bone-marrow in a case of severe anæmia. Thomas and Rolleston (1910) describe a case of fatal aplastic anæmia which followed an infection of the gums with the spirilla and fusiform bacilli of Vincent's angina. Proescher and White (1907) found spirochætes in two cases of Hodgkin's disease where they occurred in large numbers in the affected glands. In these cases we are unable to exclude syphilitic infection, but at the same time it must be admitted that in some cases it may be an entirely different species of spirochæte even although it is extremely similar to *Treponema pallidum* in morphology. As a striking example of the marked similarity of the two different species of treponemata as viewed under the microscope we give two drawings (figs. 65 and 66, Plate II) to illustrate the resemblance of *Treponema microdentium* in a culture to *Treponema pallidum* as it occurred in a case of congenital specific liver.

Baermann found *Spirochæta refringens* in the enlarged glands of a monkey infected with syphilis, and this demonstrates the possibility of this organism becoming a blood spirochæte. Scherber states that *Spirochæta balanitidis* can make its way into the blood-stream. If medical men in this country would begin a systematic examination of the mouths of their patients, we have not the slightest doubt that, like ourselves, they would be astonished to find millions of spirochætes in small scrapings from the alveolar margin. These in many cases are too numerous, even if they are considered only saprophytes, to be associated with good health. They must be elaborating toxins of a peculiar character and they must also assist in the general destruction of the tissues in the alveolar margin. Pathologists never seriously consider that in pyorrhœa it may be the spirochætes which are the chief cause of this widespread disease. Noguchi (1912) has recently shown that cultures of *Treponema microdentium* and *Treponema mucosum* cause inflammation and induration when injected into the tissues of animals, and if organisms now gained access to this devitalized tissue an extremely chronic condition such as pyorrhœa is set up in which millions of spirochætes live and flourish in symbiosis with numerous cocci and bacilli. The vaccine treatment of pyorrhœa alveolaris is in most cases unsatisfactory and we venture to suggest that a mixed vaccine of bacteria and spirochætes might yield better results.

The spirochæte associated with Vincent's angina seems now almost definitely to be of pathological importance.

THE PATHOLOGICAL SIGNIFICANCE OF SPIROCHÆTES IN THE
HUMAN FÆCES.

It has been shown in this paper that spirochætes occur in the fæces of apparently normal human beings in this country, and this is of great interest as they have been noted in large numbers in the fæces of a case of dysentery by Le Dantec, and in the stools of cholera patients by Kowalski. We found spirochætes not only in a certain number of healthy human beings but also in 50 per cent. of cases affected with chronic rheumatoid arthritis. We also found them in large numbers in the fæces of a case of severe anæmia. Again, it is impossible to state that these are of pathogenic importance, but we have noted that undoubtedly they increase in numbers in certain conditions where the vitality of an animal has been lowered by some intercurrent disease such as trypanosomiasis, severe tuberculosis, or diarrhœa. Balfour noted them in the intestines of animals infected with trypanosomiasis in the Sudan, and Sambon found them in the gastric ulcers of a fox. It must be kept in mind that they occur in apparently normal human beings in more or less perfect health, but again we do not think these ought to be considered as of no pathological importance. It is known that cancer of the mouth is often closely associated with syphilis, and the possibility of spirochætes in the intestine aiding in any way the beginning of that common disease, the carcinoma of the rectum, ought not to be lost sight of. It is interesting to note that in two strong and healthy men, who were feeling just a little out of sorts, very numerous spirochætes of both the varieties described by Werner were found. These were so numerous as to cause the patients to feel a little alarmed, but after the administration of calomel they disappeared in a few days. Metchnikoff suggested years ago that life might be prolonged by proper disinfection of the alimentary tract and proper regulation of the action of the bowels, but little seems to be known as to the exact organism which is most harmful in the production of toxæmia. The work of Sir Arbuthnot Lane in removing by operation portions of the gut and the wonderful effect produced by this procedure in certain joint troubles shows the great importance of a thorough pathological research in this matter.

For years medical men have sought the cause of rheumatoid arthritis, pernicious anæmia, lymphadenoma, and other diseases associated with bad teeth and intestinal trouble without much success, and we venture to suggest that more attention be devoted to the study of the common spirochæte.

SUMMARY.

(1) Several types of spirochæte are associated with *Pyorrhœa alveolaris*, but those which predominate seem to belong to the types *Spirochæta buccalis* and *Spirochæta vincenti*. Vincent's angina is always associated with fusiform bacilli, and severe pyorrhœa may also be associated with these bacilli.

(2) *Spirochæta buccalis* in many respects resembles *Spirochæta refringens* and *Spirochæta balanitidis* in morphological characters. *Spirochæta buccalis* and *Spirochæta vincenti* have been so confused and so imperfectly described that it is quite impossible to determine, from the descriptions of various observers, whether we are dealing with two different species or the same species. From our own observations, however, we recognize two types, one of which we have described as *Spirochæta buccalis* and the other as *Spirochæta vincenti*. Both these may be found associated with Vincent's angina, and also with pyorrhœa.

(3) The type of spirochæte in the mouth described by us as *Spirochæta buccalis* was seen in some specimens to have a series of dark-stained areas suggesting the formation of granules or coccoid bodies. The fixation was by heat and the stain used was gentian violet, so we cannot exclude possible shrinkage of the protoplasm by this method giving rise to such an appearance. We also used wet fixation.

(4) The type of spirochæte described by us as *Spirochæta vincenti* is common in pyorrhœa alveolaris, Vincent's angina, and other suppurative lesions of the mouth. It is a thinner spirochæte than *Spirochæta buccalis*; it is not ribbon-shaped when viewed under dark-ground illumination, and the body is extremely flexible, the coils not being fixed; they show in stained specimens long thin spirochætes with irregular waves (fig. 2, Plate I). This, in our opinion, is quite a distinct type from *Spirochæta buccalis* as far as we can make out from morphology alone.

(5) We are of the opinion that in the conditions known as Vincent's angina, in which spirochætes are found associated with fusiform bacilli, various types of spirochætes occur, and it is this which has caused so much confusion in the descriptions given by various observers of *Spirochæta vincenti*.

(6) The two species of spirochæte found by Werner in the fæces

of an apparently normal human being have been found by us in the fæces of healthy men in this country. In two cases these occurred in very large numbers.

(7) Spirochætes corresponding to the species *Spirochæta eurygyrata* were found in the fæces of 50 per cent. of chronic rheumatoid arthritis cases examined, but always in small numbers, and were sometimes difficult to find.

(8) Spirochætes in very large numbers corresponding to the species *Spirochæta stenogyrate* were found by us in the stools of an obscure case of profound anæmia.

(9) A treponema, probably a new species, has been found in a specimen of human fæces kept in a bottle with some water for several months. This is a much finer organism than we have seen previously described. It may measure 20μ in length or more, and has fifteen to twenty or more minute fixed coils. Another spirochæte was found in the same specimen which was short and thick.

(10) An undescribed spirochæte has been found in the fæces of healthy and diseased guinea-pigs. This is a short organism with pointed ends, measuring in length from 3.75μ to about 7μ as a maximum. The waves are about three in number. When stained with gentian violet a series of dark areas are seen on the body. Another species was also found on one occasion in the fæces of a guinea-pig with diarrhoea (*see* figs. 47 to 52, Plate II).

(11) Spirochætes found by the authors in rats, dogs and fowls have also been described and figured.

(12) It is strongly suggested that more attention be paid by pathologists to the common spirochætes of the mouth, and also the intestines, which are usually considered harmless saprophytes, for there is a considerable amount of evidence that possibly these harmless parasites may proceed under certain conditions to the deeper tissues and even into the blood-stream, and so cause profound and obscure illnesses.

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Marcus Beck Laboratory Reports.—No. 4.

Controlled Growth *en masse* (Somatic Growth) of Embryonic Chick Tissue *in vitro*.

By DAVID THOMSON, M.B., Ch.B.Edin., D.P.H.Cantab.¹

INTRODUCTION.

IN a previous paper (Thomson, 1914)² it was shown that small portions of live tissue (chick and human) when placed in a medium composed of blood plasma of a fowl one part, plus extract of chick embryo one part, and incubated at 37·5° C., produced a new growth, which radiated out from original tissue on all sides in an uncontrolled fashion. A portion of heart, liver, or spleen, &c., did not grow into any definite structure or shape like a heart, liver, or spleen. The cells simply multiplied without any tendency to produce a definite grouping, or in other words, there was no somatic control. In the same paper, however, I showed that when definite uninjured masses of a chick embryo were placed in the medium, then these masses increased in size while retaining their original shape; in other words, they showed a controlled increase in size or growth. A total chick embryo twenty-four hours old increased in size as a whole without producing any radiating uncontrolled growth of cells around it. The tail of a young chick embryo and also a toe showed the same increase under control. In the two latter cases

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² *Proc. Roy. Soc. Med.*, 1914, vii (Marcus Beck Lab. Rep. No. 2), p. 34.

uncontrolled growth occurred only at the cut or injured margin of the tail and toe.

It was suggested to me that the increase in size obtained might only be apparent, due to the flattening out of the mass of tissue, but I have since satisfied myself that this is not the case, but that the increase in size is due to a true and definite growth.

(I) GROWTH UNDER CONTROL (SOMATIC GROWTH) IN VITRO OF AN EMBRYONIC CHICK TOE.

This phenomenon is illustrated by photomicrographs in the accompanying plate. The toe was cut from a nine-day-old chick embryo, placed in the culture medium and incubated at 37.5°C . Fig. 1 shows the size of the toe when newly placed in the medium (40 diameters). The remaining photographs show exactly the same magnification; fig. 2 shows an increase in size after twenty hours' incubation, and fig. 3 shows a further increase after forty-eight hours' incubation. Note also that there is an uncontrolled growth of cells from the cut or injured end. On the third day the uncontrolled growth was cut away and the toe washed for thirty seconds in Ringer's solution and then transferred to fresh medium. On the fifth day this was repeated, but after this no further increase in size was obtained. Fig. 4 represents the size of the toe on the fifth day of incubation. I am quite satisfied that this increase in size is a real growth under control and that it is not due to any flattening out of the original tissue. The culture preparation is of the nature of a hanging drop, the medium being of a solid gelatinous consistence. It is inconceivable that in these circumstances the toe could flatten out to attain an increase in size as depicted. Figs. 5 and 6 show the increase in size of the tip of the tongue cut from a fifteen-day-old chick embryo, after seven days' incubation in the same medium. Again note the uncontrolled growth from the cut margin. It would appear that all circumscribed masses of tissue will increase in size *in vitro* in a similar manner. A young embryonic feather of a twelve-day-old chick embryo increased in size *in vitro* by more than 50 per cent. in four days, and the lens of the eye of a five-day-old chick embryo showed a similar increase in area *in vitro* in four days. In both these cases the definite shape was retained and no uncontrolled growth occurred from the definite margins of these structures.

(II) CONCLUSIONS.

It would appear to me that uncontrolled growth can only take place from injured surfaces where there is no basement membrane. The uninjured intact surfaces form a definite membrane, from which a new uncontrolled growth cannot radiate. It is a characteristic of malignant tumours that they do not possess a basement membrane, and it is probable that this is the deciding cause of their malignancy, since the growth is not limited in a definite confined structure, but is able to radiate in any direction in an uncontrolled fashion. Carrel has shown that this form of uncontrolled growth in chick embryo tissue can be continued indefinitely (for over two years) provided the tissue be cut into smaller portions and planted in fresh medium. I have no doubt that the toe in my experiments ceased to grow further on obtaining a certain size due to the difficulty of obtaining nutriment from the surrounding medium. When it became too large, the nutriment was unable to penetrate by osmosis into the central portion, since there was no circulation. A further increase *in vitro* would probably be difficult, unless by some means an artificial circulation could be set up so as to enable the nutrient medium to get at the central portions of the tissue.

EXPLANATION OF PLATE.

*Photomicrographs 1 to 6 are all of identical magnification, $\times 40$ diameters.
All were taken from the live growing tissue.*

FIG. 1.—Toe of a nine-day-old chick embryo newly placed in a culture medium composed of blood plasma of a hen one part plus extract of chick embryo one part.

FIG. 2.—The same after twenty hours' incubation at 37.5° C.

FIG. 3.—The same after forty-eight hours' incubation.

FIG. 4.—The same after five days' incubation (third passage into fresh medium).

FIG. 5.—Tip of tongue of fifteen-day-old chick embryo, newly placed in the culture medium.

FIG. 6.—The same after seven days' incubation at 37.5° C.

1



2



3



4



5



6



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Marcus Beck Laboratory Reports.—No. 5.

Some Observations on the Development of Red Blood Cells as seen during the Growth of Embryonic Chick Tissue *in vitro*.

By DAVID THOMSON, M.B., Ch.B.Edin., D.P.H.Cantab.¹

(I) INTRODUCTION.

A CONSIDERABLE amount of research has been done on the development of red cells in many kinds of animals by several observers, *vide* Keibel and Mall (1912) and Schäfer (1910). The entire process has, however, not yet been fully elucidated, and there is a considerable amount of controversy on the subject. It would appear to me that observations on the growth *in vitro* of blood-forming tissues must be a very important method of investigating this subject, since the process can be watched continuously under the microscope *in vivo*.

(II) TECHNIQUE.

A simplification of Carrel's technique for the cultivation of tissues *in vitro* has already been fully described (Thomson, 1914). It is unnecessary, therefore, to describe it again in detail. Small portions of blood-forming tissues of the embryonic chick (spleen and bone-marrow) were grown in a medium composed of the blood plasma of a hen one part, plus extract of embryonic chick one part. The tissue was placed in a drop of this medium on a sterile cover-slip, which was then inverted over a hollowed-out thick glass slide and hermetically sealed

¹ Grocers' Research Scholar. From the Marcus Beck Laboratory, Royal Society of Medicine, London.

EXPLANATION OF PLATE I.

PEN AND INK DRAWINGS FROM LIVE CULTURES.

Magnification about 800 diameters.

FIG. 1A.—Amœboid cell containing highly refractile granules and two pink vacuoles (*a*). Drawn from a live culture of spleen tissue *in vitro*, after forty-eight hours' incubation at 37.5° C. (Spleen tissue obtained from a twelve-days-old chick embryo.)

FIG. 2A.—The same cell two hours later, showing three larger pink vacuoles.

FIG. 3A.—The same, one hour later than 2A, showing the discharge of three red cells.

FIGS. 1B to 3B, drawn from the same culture preparation, show the production of six red cells from one amœboid cell. Only two hours elapsed between 1B and 3B.

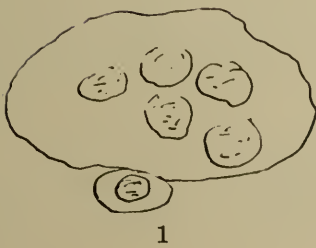
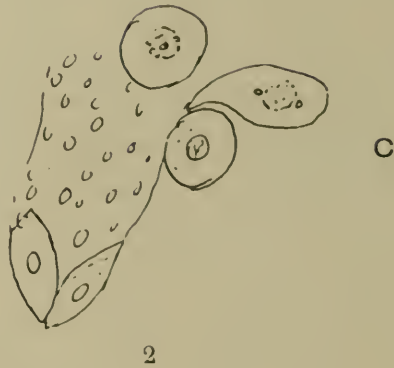
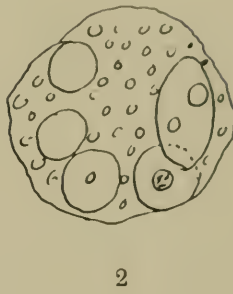
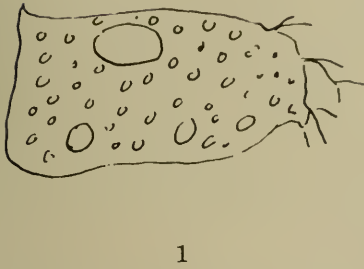
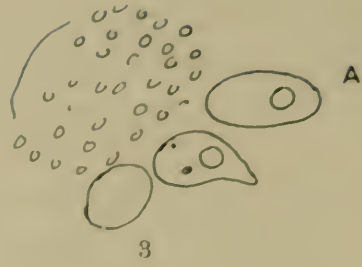
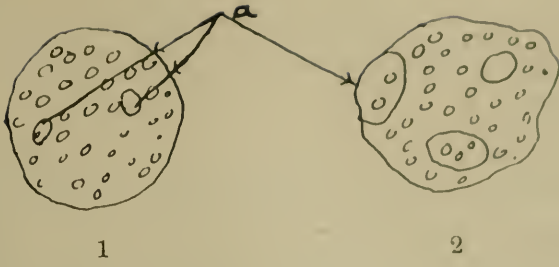
FIGS. 1C and 2C show the same process. The time which elapsed between 1C and 2C was only fifteen minutes.

FIGS. 1D to 6D were drawn from a Giemsa-stained smear of the bone-marrow of a sixteen-day-old chick embryo.

FIG. 1D shows the nucleus split into five, preparatory to the formation of nucleated red cells.

FIGS. 2D to 6D show the young nucleated red cells in a gradual transition from round to oval, and show how the nucleus gradually becomes smaller in size.

PLATE I.



with paraffin wax. In a transparent culture preparation of this nature, the growth of the tissues can be watched continuously with the highest powers of the microscope, provided the preparation is kept at blood-heat by means of an electric warm stage.

(III) OBSERVATIONS ON SPLEEN CULTURES (EMBRYONIC CHICK).

In twelve-day-old chick embryos the bone-marrow is not completely developed. It is quite pale and colourless and no red blood can be obtained from it. At this age, however, the spleen is very red and vascular, and would appear to be generating blood cells very actively. The following observations on the development of the red corpuscles were made chiefly by watching the growth *in vitro* of this splenic tissue.

In cultures of the spleen tissue of embryos from fifteen to nineteen days old the production of red cells was less marked; possibly at this age the spleen does not form the blood elements so vigorously since now the red marrow of the bones has developed, and most probably functions as the chief blood-producing tissue of the embryo.

When a small portion of splenic tissue (twelve-day-old chick embryo) is placed in the plasma medium and incubated at 37.5°C ., one can observe quite a definite emigration of amœboid cells into the surrounding plasma in three hours. After twenty-four hours incubation the tissue is surrounded with very large numbers of these cells which appear to be leucocyte-producing cells. This is not a mere emigration of cells from the tissue mass, since the cells can be seen to divide, so that we have multiplication as well as emigration. After forty-eight hours elongated cells have appeared radiating out from the original mass of tissue. These probably represent the growth of the connective tissue stroma of the spleen. After seventy-two hours red cells are usually found around the original tissue in large numbers, but they are not so numerous in some culture preparations as in others. Red cells are capable of migrating from the original tissue into the plasma, and these are apt to be confused with the red cells which are actually developed in the surrounding medium from parent amœboid cells. The production of red cells from the latter has, however, been watched in the live culture on the warm stage under the microscope.

The nucleated red cells are apparently produced in two ways:—

- (a) By the development of daughter nucleated red cells within colourless amœboid parent cells.
- (b) By simple mitosis of the nucleated red cells already developed by method (a).

(a) The colourless parent cells destined to produce red cells show active amœboid movement and contain numerous highly refractile granules. In the live condition the nucleus is scarcely visible. The first evidence of the formation of daughter red cells within them (as observed in live cultures) is the appearance of pinkish vacuoles in the protoplasm. These vacuoles increase in size and finally the faint outline of red cells can be discerned forming within the protoplasm of the parent cell. These become more distinct and more pink in colour and eventually they are discharged as definite red cells, or it might be more accurate to say that the colourless amœboid cell eventually breaks up into a number of nucleated red cells. Some of these are apparently capable of producing as many as six of the latter. I have attempted to illustrate this phenomenon as it appeared to occur in the live culture preparations by the pen-and-ink sketches, Plate I. Fig. 1A shows a parent amœboid cell containing highly refractile granules and two small pink vacuoles (a). Fig. 2 is the same cell two hours later, showing three large pink vacuoles, and fig. 3 is the same cell one hour later than fig. 2, showing the discharge of three red cells. Figs. 1, 2, and 3B show a similar evolution of six red cells, the time elapsing between 1 and 3 being two hours. Fig. 1C shows the red cells forming within a large parent cell and fig. 2C represents the same cell fifteen minutes later, showing the discharge of three red cells. The red cells developing within the parent cell undergo a gradual change in colour and shape. At first they are round with a large homogeneous nucleus and clear, colourless protoplasm. They gradually become more oval and simultaneously they develop a pinkish colour, while the nucleus becomes smaller and granular. This gradual transition in shape and in the size of the nucleus is depicted in figs. 2 to 6D. In the live culture specimens it is very difficult to see the nuclei of the parent amœboid cells. From stained specimens of these cultures, however, it would appear that the nucleus splits up into several portions, each of which becomes the nucleus of a daughter red cell. In Plate II I have attempted to illustrate by photomicrographs what I have already depicted in the pen-and-ink drawings. Photomicrograph 1, taken from the live growth of embryonic chick spleen *in vitro*, shows a few parent amœboid cells and also some red cells which have been discharged from them. No. 2 shows exactly the same area twenty-one hours later, and the marked increase in the number of red cells is quite evident. The remaining photomicrographs were taken from stained preparations. No. 3 shows a large parent cell (P) with daughter nucleated red cells within it.

EXPLANATION OF PLATE II (PHOTOMICROGRAPHS).

FIG. 1.—Photomicrograph of red-cell-producing tissue growing *in vitro*. (Spleen tissue of twelve days' embryonic chick.) Magnification about 420 diameters.

FIG. 2.—The same twenty-one hours later, showing a marked increase in the number of red cells. N.B.—1 and 2 are photomicrographs of the live tissue. The remaining photographs are taken from stained preparations.

FIG. 3 shows nucleated red cells forming within a large cell (P) from spleen of a twelve days' chick embryo after forty-nine hours' growth *in vitro*. ($\times 420$.)

FIG. 4 shows a mass of red-cell-producing tissue. The cells are united by protoplasmic processes and contain from one to six nuclei. From spleen tissue (of twelve days' chick embryo) growing *in vitro*.

FIG. 5 shows two nucleated red cells forming inside a large round cell (P). (From growth of spleen tissue *in vitro*.) ($\times 250$.)

FIG. 6 shows the formation of four nucleated red cells, also a pair, one of which is already oval but not yet separated. ($\times 420$.)

FIGS. 7 and 8 show the formation of three and four nucleated red cells respectively. ($\times 420$.)

FIG. 9.—Ditto. Shows several pairs. This is possibly simple mitosis of nucleated red cells. ($\times 250$.)

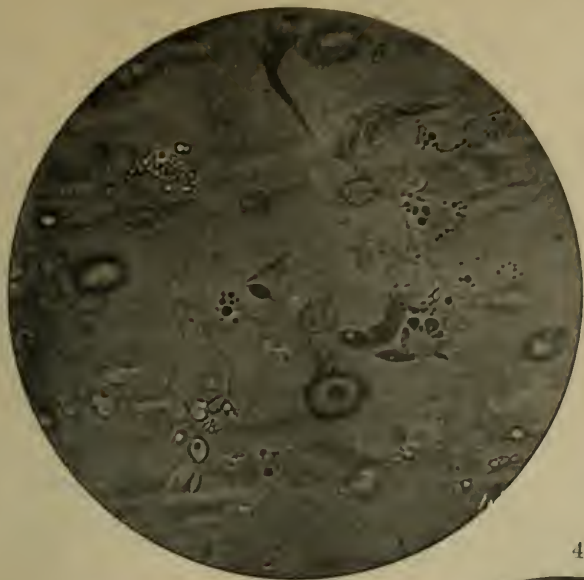
FIGS. 7 to 9 were taken from the growth *in vitro* of tissues (undetermined) from a three-day-old chick embryo.

FIG. 10.—Spleen smear of a sixteen-day-old chick embryo. Note multinucleated mass in centre. ($\times 420$.)

FIG. 11.—Smear from spleen puncture, from a human case of splenic anaemia. Note nucleated red cell (N), also dividing red cell (M). ($\times 420$.)

PLATE II.

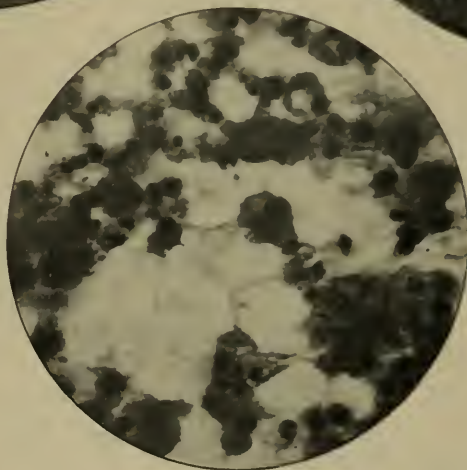
1



2



4



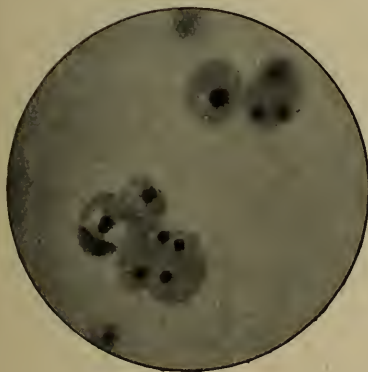
3



5



6



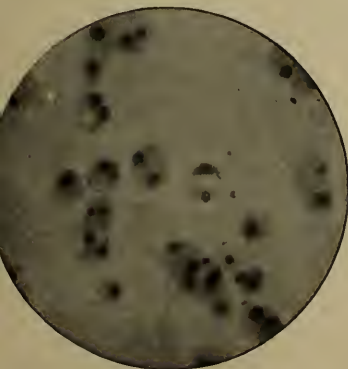
7



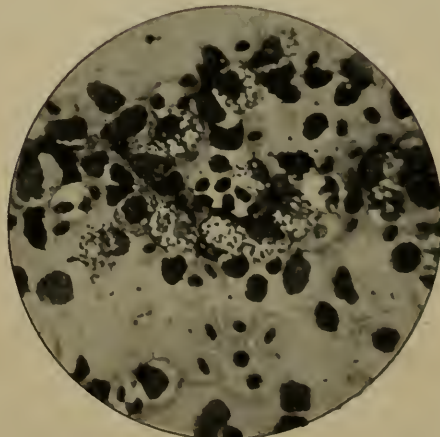
8



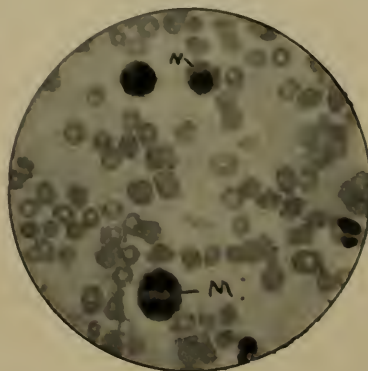
9



10



11



EXPLANATION OF COLOURED PLATE III.

FIGS. 1 to 8.—Stages in the development of red cells, from a Giemsa-stained smear of the spleen of a sixteen-day-old chick embryo. Magnification, 1,000 diameters.

FIGS. 9 to 14.—Stages in the development of red cells from a Giemsa-stained smear of the spleen of a human case of splenic anæmia (spleen puncture). ($\times 1,000$.)

FIGS. 1 and 2.—Cells destined to produce red cells.

FIGS. 3 and 4.—Mitotic figures preparatory to the formation of red cells (nuclear division).

FIG. 5.—The earliest form of nucleated red cell. Note the large homogeneous nucleus and the blue protoplasm.

FIG. 6.—Next stage showing a smaller clock-like nucleus, with commencing change in the colour of the protoplasm. (Cell still round in shape.)

FIG. 7.—Nucleus becoming smaller and more compact. Cell becoming oval and the protoplasm becoming red.

FIG. 8.—Fully developed nucleated red cell. Protoplasm red. Cell oval. Nucleus compact and oval.

FIGS. 9 to 12 show the same stages in the case of human blood.

FIGS. 13 and 14 show further stages in which the nucleus is lost.

PLATE III



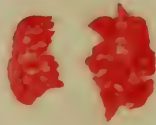
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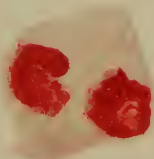
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8



9



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11



12



13



14

It was impossible, unfortunately, to get the whole of this cell completely in focus. No. 5 shows a similar parent cell (lower magnification) with two daughter red cells within it. No. 4 shows a mass of parent amœboid cells, each containing from one to six nuclei. The cells are connected with each other by protoplasmic processes. This photograph resembles markedly fig. 30, p. 30, in Schäfer's "Essentials of Histology" (1910), in which is shown the development of blood corpuscles in the vascular area of the guinea-pig. Photomicrographs 6 to 9 (growth *in vitro* of blood-forming tissues of an embryonic chick three days old) show the formation of nucleated red cells in pairs, threes and fours; some of these form at the margin in the shape of a nucleated crescent. No. 10 is taken from a Giemsa-stained smear of the spleen of a sixteen-day-old chick embryo, and shows in the centre a cell mass containing six nuclei. This I believe is a parent colourless cell about to form six daughter nucleated red cells. No. 11, from a Giemsa-stained smear (spleen puncture) from a case of human splenic anæmia, shows a nucleated red cell (N), and also one in the process of mitosis (M). It is interesting to note that the human nucleated red cell is about exactly the same size as the nucleated red cells of the chick as shown in photomicrograph 10 taken at an identical magnification, and that the non-nucleated human red cells are much smaller than the nucleated forms.

(b) *The Multiplication of Nucleated Red Cells by Simple Division.*—It is well known that nucleated red cells can multiply by simple mitosis. This process has been fully observed in the blood of newts and a cinematographic film of the phenomenon has even been taken by Dr. Comandon (Pathé Frères). I am in doubt as to whether the photomicrographs 6 to 9, Plate II, represent simply the division of already existing nucleated red cells of the chick or whether they show the production of daughter red cells from the original amœboid parent cells. If they represent the former then the photographs would appear to indicate that a nucleated red cell is capable of dividing into two, three and four red cells.

(IV) OBSERVATIONS ON BONE-MARROW CULTURES (EMBRYONIC CHICK).

In these the development of red cells was similar to that already described under the spleen cultures. Foot (1913) made observations on the cultivation *in vitro* of bone-marrow of chicks, more especially with regard to the development of the leucocytes. He does not appear to

have observed the development of red cells, and he even states that the red cells in the tissue die off in the culture preparation. I am unable to agree with his observations on this point.

(V) FURTHER OBSERVATIONS.

I should have stated that the young daughter red cells produced from the parent amoeboid cells vary in size. Some are at least twice as large as others. As a rule the daughter red cells each contain a vacuole in the early stage. This vacuole is situated on one side of the nucleus, and in unstained specimens appears like a highly refractile granule (*vide* photomicrograph 1, Plate II). In the coloured plate, figs. 1 to 8 are painted from a Giemsa-stained smear of the spleen of a sixteen-day-old chick embryo. Figs. 1 to 4 show what I believe to be the parent amoeboid cells, and in the latter two the nucleus is undergoing division. Fig. 5 is a young daughter red cell, and figs. 6, 7, and 8 show the gradual transition to the fully developed red cell. Figs. 9 to 14 are painted from a Giemsa-stained smear of a spleen puncture from a case of human splenic anæmia. Here it would appear that similar transitions are occurring to those seen in the bone-marrow smear of the embryonic chick. Fig. 10, however, is probably simply a divided red cell and not a parent amoeboid cell. In the human case the same transition in colour is also noticeable.

Before concluding I wish to acknowledge the help given me by Dr. J. Leitch Wilson, with regard to the continuous microscopic observations made on the live spleen cultures.

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Occasional Lectures

Delivered during the Session, 1913-14

October 20, 1913.

Dr. HIDEYO NOGUCHI—

“On Some of the Recent Advances in the Field of Microbiology; with Demonstrations of the Pure Cultures of various Spirochætes, of the Viruses of Rabies and Poliomyelitis, and of *Treponema pallidum* in the Brains of General Paralytics.”

November 20, 1913.

*Dr. H. BAYON—

“The Leprosy Problem in the British Empire.”

January 26, 1914.

*Surgeon MURRAY LEVICK, R.N.—

“The Experiences of Captain Scott's Northern Party from a Medical Point of View.”

March 23, 1914.

Surgeon-General GORGAS—

“Anti-mosquito Work at Panama.”

April 8, 1914.

Dr. FERREYROLLES—

“Metallic Ferments: Their Bio-physical and Therapeutic Properties.”

* NOTE.—Those lectures marked with an asterisk were of the nature of running remarks on photographs or drawings exhibited, too numerous for publication. A few reprints of the *Lancet's* reports of these are available for Fellows who make immediate application.

The Royal Society of Medicine.

October 20, 1913.

Sir FRANCIS H. CHAMPNEYS, Bt., M.D., President, in the Chair.

On Some of the Recent Advances in the Field of Microbiology ;
with Demonstrations of the Pure Cultures of various
Spirochætes, of the Viruses of Rabies and Poliomyelitis,
and of *Treponema pallidum* in the Brains of General
Paralytics.

By HIDEYO NOGUCHI, M.D., M.S., Sc.D.

MR. PRESIDENT AND FELLOWS OF THE ROYAL SOCIETY OF MEDICINE,—

Permit me to express my sincere appreciation of the great honour which your distinguished Society has conferred upon me by inviting me to present before you an account of some of the recent events in the domain of microbiology. I am not unaware of the difficulty that you are put to in trying to understand my defective speech, but it is to be hoped that this drawback may be remedied in great measure by the aid of actual demonstrations which have been arranged for your inspection. Besides the microscopical preparations and other specimens (cultures), I shall freely resort to projections, and this will, I hope, in part relieve the speaker of the sense of guilt under which he is suffering for imposing upon your patience.

The subjects to which I wish to draw your attention this evening are rather diverse, and they have been selected not only because you have assigned them to me, but also because, though superficially unconnected with each other, they are nevertheless closely correlated from a certain point of view—namely, that of the question of cultivation. Thus, I shall speak of the cultivation of various pathogenic and

saprophytic spirochætes and of that of the viruses of rabies and poliomyelitis, and finally on the relation of *Treponema pallidum* to the so-called parasymphilitic conditions. The point of resemblance that I find to exist between these subjects is that none of these organisms have been hitherto successfully cultivated. In order to overcome this obstacle it was necessary to work out certain specialized techniques of cultivation. The only justification for bringing in the subject of syphilis and parasymphilis in this connexion is the fact that the demonstration of *Treponema pallidum* in general paralysis and tabes was an incident in the cultural studies of the organism of syphilis, and it seems to me not unpardonable to dwell upon this particular subject, towards the ætiological solution of which Gowers, Mott, Head, Robertson, and other workers in this country have contributed so largely.

Before entering on the individual topics a few general remarks on the cultivation of these micro-organisms may not be amiss. The task of cultivating spirochætes, especially the pathogenic varieties invading the tissues and blood, was a problem of long standing, and the undisputed proof of this achievement having been definitely effected was not forthcoming until 1911-12, when not only *Treponema pallidum* of syphilis and *Treponema pertenue* of yaws, but also the well-known blood spirochætes of the relapsing fevers (*Spirochæta obermeieri*), tick fever (*Spirochæta duttoni* and *Spirochæta kochi*), and of fowl spirochætosis (*Spirochæta gallinarum*), together with several species of a saprophytic nature, were obtained in pure cultures.¹ A lesson was learned from these findings, namely, that the micro-organisms which had hitherto proved resistant to artificial cultivation could be made to continue multiplying for an indefinite period of time outside of the animal body under a suitable combination of cultural conditions. It was also shown that success in the cultivation of this class of organisms is often inconstant, and that much patience and experience are necessary to bring about the desired result. Not infrequently a sudden and sometimes an early loss of virulence was noticed to occur in the organisms under cultivation. Luckily the characteristic morphology of spirochætes renders the identification of the culture possible, even if the latter should alter as regards its pathogenic property.

From what has been said it is easy to assume that the possibility exists of working out various combinations of conditions suitable for

¹ For the chronological and technical details of the cultivation of these spirochætes I refer the reader to the bibliography appended.

obtaining a culture of some of the infective agents whose existence has been recognized only through their pathogenic behaviour in man and animals. To this class belong the viruses of rabies, poliomyelitis, hog-cholera, variola, vaccinia, various contagious exanthemata, yellow fever, &c., most of which are known as filter-passers. It seemed opportune to make a fresh attempt with specialized methods after we had learned that spirochætes, once so difficult to grow, are now amenable to cultivation.

The advantages which are offered by the pure culture of a given micro-organism in studying its biologic and morphologic characteristics need not be emphasized. But one is apt to overlook a peculiar alteration which a pure culture may present in the case of certain micro-organisms. I refer to the peculiar morphological modifications which some protozoan organisms are apt to undergo—for example, the rosette formation of trypanosomes or the assumption of the flagellate form of a *Leishmania* in artificial cultures. Nor should we overlook a possibility of encountering certain unfamiliar forms in a culture when dealing with organisms whose biological and morphological features in natural habit are only imperfectly understood. As an example of the latter phenomenon I wish to refer to the granular forms of spirochætes. Leishman, Balfour, Nuttall, Hindle, and others have pointed out the presence of such forms in the infected blood or in the body of ticks infected with *Spirochæta duttoni* as well as *Spirochæta gallinarum*, and I myself was able to demonstrate similar granules in the pure cultures of *Treponema pallidum*. This phenomenon, however insignificant it may appear in itself, was destined to furnish a key to one of the most disputed problems of the past fifty years—namely, the problem of so-called parasyphilis, since it was this very idea that prompted me to undertake the search for *Treponema pallidum* in one form or another in the brains of general paralytics and in the spinal cord from cases of tabes dorsalis.

According to the view I now hold, spirochætes may be classified into three groups according to the conditions under which they can be cultivated on artificial media. Thus (1) the spirochætes which chiefly invade the various tissues require the presence of fresh animal tissue as well as of suitable nutritive substances and strict anaerobiosis. (2) The blood-residing varieties, like the first group, also require the presence of fresh animal tissue and suitable nutritive substances, but they cannot grow unless a minute quantity of oxygen is provided. (3) The saprophytic varieties resemble the first group in most respects, but the presence of fresh animal tissue is not essential for their growth, and

their adaptation to artificial media is comparatively much easier. To the first group belong *Treponema pallidum* and *Treponema pertenue*; to the second, *Spirochæta duttoni*, *Spirochæta kochi*, *Spirochæta obermeieri*, *Spirochæta novyi*, and *Spirochæta gallinarum*; and to the third, *Treponema macrodentium*, *Treponema microdentium*, *Treponema mucosum*, *Treponema calligyrum*, *Spirochæta refringens*, *Spirochæta buccalis*, *Spirochæta vincenti*, *Spirochæta phagedenis*, &c. I shall omit the descriptions of these organisms, but will refer to the cultures exhibited here this evening.

Referring to the viruses of rabies and poliomyelitis, I wish to say that the cultural conditions required by them are found to resemble closely those necessary for the growth of the pathogenic spirochætes (including the first and second groups). They are likewise extremely fastidious as regards the sources and composition of the culture media.

I shall now present in detail (1) a review of the cultivation of *Treponema pallidum*; (2) an account of the experiments in connexion with the cultivation of the virus of rabies; and (3) the ætiology of so-called parasymphilitic conditions.

(I) THE CULTIVATION OF *TREPONEMA PALLIDUM*.

Since Schereschewsky, in 1909, announced that he had succeeded in cultivating from human syphilitic tissues certain spirochætes in an impure state, believed by him to be *Treponema pallidum*, there have appeared a number of contributions on the same subject from various sources. Up to the present date we count at least ten investigators who claim to have obtained pure cultures of *Treponema pallidum*—Mühlens, W. H. Hoffmann, Noguchi, Sowade, Arnheim, Tomaszewski, Shmammine, Nakano and Baeslack, and very recently also Schereschewsky, and three others who obtained only impure growths—namely, Bruckner, Galasesco, and Boas.

The culture media employed by the different investigators may be divided into three main groups, namely—(a) solidified serum of horse or other animals (Schereschewsky, Mühlens, W. H. Hoffmann, Tomaszewski, Sowade, Nakano, Shmammine, Bruckner, and Galasesco and Boas); (b) serum-water with fresh animal tissue¹ (Noguchi); and (c) ascites-agar with fresh animal tissue (Noguchi). Of those who employed Schereschewsky's medium, Shmammine modified it by adding a small amount of sodium nucleinicum and Nakano, peptone-agar.

¹ The anaerobic principle introduced by Th. Smith.

The sources of the materials were various. Thus, Schereschewsky, Sowade, Tomaszewski, Arnheim, Bruckner and Galasesco employed exclusively or mainly human syphilitic tissues; while Mühlens, Hoffmann, Shmamine, Nakano, and especially Noguchi, experimented with the human as well as rabbit's syphilitic tissues. It is important, however, to notice that Mühlens and others reported one success from rabbit strains, while Noguchi obtained six pure strains from ten different sources.

Cultivations were carried out by all except Noguchi without strict anaerobic precaution. Thus it is evident that the strains of spirochætes cultivated by the former investigators are able to multiply and maintain their existence for many generations in a semi-coagulated horse serum. The spirochætæ isolated by Noguchi differed from theirs in not being able to exist without the fresh tissue constituent as well as the complete exclusion of oxygen.

Noguchi made the distinction that his serum-water tissue method is exclusively for the cultivation of rabbit's strains in testicular lesions, while the ascitic agar tissue medium is suitable only for the impure materials derived from human syphilitic tissues. He found that the human strain cannot be cultivated in the first mentioned medium and the rabbit strain does not develop in the first generation in ascitic agar tissue, or in any other medium so far known (including Schereschewsky's medium with or without addition of fresh sterile tissue). This fact has been confirmed by Tomaszewski.

As regards the morphology of the spirochætes cultivated by different investigators, they admit that the cultures contained both fine and coarser forms, especially when derived from human sources. Schereschewsky, as well as Mühlens, Shmamine and others, noticed this fact. Mühlens believed that the two forms are different varieties, while Schereschewsky and Shmamine considered them to be one and the same variety developing under different conditions. Noguchi endorsed the view held by Mühlens.

The first successful production of syphilitic lesions in animals by means of pure cultures was reported by Noguchi (1911), who, using two strains derived from the rabbit's syphiloma in testicles, caused typical testicular lesions in several rabbits; next by Hoffmann (1911), Sowade, Shmamine (1912), and Nakano (1912), while Bruckner and Galasesco in 1910 reported one success in the rabbit by means of their impure material (third generation). Tomaszewski (1912), as well as Sowade (1911), also succeeded in infecting rabbits with their impure

cultures derived from human materials. Moreover, Noguchi (1912) produced typical sclerotic skin lesions on the eyebrows of several monkeys (*Macacus* and *Cercopithecus*) by means of pure cultures derived from human syphilitic tissues. The virulence of this organism disappeared in about four months after cultivation, while the other biological properties remained, according to Noguchi, unmodified even after nearly three years.

Fundamental discrepancies exist regarding the biological properties of the organism cultivated on the one hand by Mühlens and Hoffmann and on the other by Noguchi. That of the former produced a putrefactive odour and multiplied not only in horse serum agar almost up to the surface, but also in plain agar and bouillon for some generations in presence of oxygen, while that of Noguchi grows only under strictly anaerobic conditions in presence of fresh sterile tissue and never produces a disagreeable odour. In spite of prolonged artificial cultivation Noguchi's spirochætes do not grow in Schereschewsky's horse serum, in plain agar or in bouillon. These differences were pointed out by Noguchi in his first publication. Later he demonstrated that certain mouth spirochætes (*Treponema microdentium*, *Treponema mucosum*) presented in pure culture morphological features indistinguishable from *Treponema pallidum*, but produce a characteristic putrefactive odour accompanied with alteration of the culture media, not unlike that described for the organism of Mühlens and Hoffmann. Tomaszewski, Arnheim, Shinamine, and Nakano noticed no odour in their *pallidum* cultures. The culture of Mühlens, which was devoid of pathogenicity from the beginning, and that of Hoffmann are quite different from those of Noguchi and the later investigators. At least it is not improbable, as pointed out by E. Hoffmann, that the successful production of syphilitic orchitis in a rabbit by W. H. Hoffmann may have been due to the use of an impure culture of the *pallidum* containing a foreign odour-producing spirochæta or some other organism.

The recent studies of Noguchi on *Treponema calligyrum*, a species occupying an intermediary position between the *pallidum* and the *refringens*, found in non-luetic lesions of human genital regions, also indicates the difficulty of identifying a spirochæta resembling the *pallidum* in cultures derived directly from human syphilitic tissues. The *calligyrum* grows much more readily in several media (including the horse serum and serum agar without fresh tissue) and can easily be mistaken for *pallidum*. The *calligyrum* grows like the *pallidum* and produces no odour or alteration of the media. It differs by lacking

pathogenicity and by appearing in non-specific lesions, and also is slightly coarser. The non-pathogenic spirochaetes that are readily cultivated in ordinary serum-agar or coagulated serum belong to this group, although the *pallidum* may possibly grow symbiotically in association with the *calligyrum*. In such an instance the culture might be pathogenic but not pure. For this reason Noguchi considers it absolutely essential, in order to obtain a pure strain of *pallidum*, that pure material, such as represented by the syphiloma of rabbit's testicles, be utilized for the purpose of cultivation. In a culture in which the *pallidum* is associated with the *calligyrum*, *refringens*, *microdentium*, or *mucosum*, it is easy to eliminate the *pallidum* in future culture generations by withdrawing the addition of the fresh tissue and neglecting strict anaerobic precautions, but the reverse cannot be accomplished.

Stress has been placed upon the antigenic property of the cultivated spirochaetes in relation to the Wassermann reaction by certain investigators, but confusion of this reaction with that of a true antigen antibody reaction is to be avoided. An emulsion of rabbit's testicle rich in *pallidum*, or a pure culture of *pallidum*, does not bind complement with most of the sera from early cases of syphilis, although they give a positive reaction more frequently in latent or tertiary cases. In latent or tertiary cases the reaction is, according to Noguchi, specific, and can be sharply separated from the Wassermann reaction by parallel series of tests. The results are different when an alcoholic extract of the *pallida* contained in tissue or cultures is used, since they are now due to the lipoidal constituents from the tissue as well as culture mass. Under these circumstances they may parallel the Wassermann reaction.

The sera of rabbits highly immunized with the pure cultures of *pallidum* contain specific agglutinins and complement-binding antibodies (Noguchi, Kolmer, Williams and Laubaugh, Nakano), while the skin of the immunized animals shows a state of hypersensitiveness to the *pallidum* extract (Noguchi). But the skin of rabbits carrying active syphilitic orchitis does not react distinctly. A hypersensitiveness of the skin was shown to occur in syphilis by Neisser, Meirowski, Jadassohn, Nobl, Finger, Landsteiner, and others, and Noguchi has made its detection more constant by the employment of an extract of several strains of pure *pallidum* cultures which had been killed by heat and then ground up. The clinical application of this procedure brought forward by Noguchi (the luetin cuti-reaction) has been confirmed by Orleman-Robinson, Wolfsohn, Nobl and Fluss. Kämmerer, Rytina, Gradwohl,

Simpson, Fagliuoli and Fisichella, Geber, Schmitter, Foster, Kaliski, Cohen, Baermann and Heinemann, Benedek, and others.¹ On the other hand, Schereschewsky, using his impure culture, and Nakano, using a filtrate of his culture, obtained indefinite results.

From the above brief review, in which technical details have been intentionally omitted, the following may be deduced:—

The cultivation of *Treponema pallidum* has undoubtedly been accomplished, but the methods available at present still give inconstant results. When impure cultures, from any human syphilitic material, are obtained, the proof of the *pallidum* is derived from successful animal inoculation; when, however, no pathogenic power exists it is impossible to affirm the presence of the *pallidum*. Even when derived from human sources the cultures of spirochætes cannot be established to be pure *pallidum* cultures, because other morphologically similar spirochætes may be present. What can be stated definitely is that the pure *pallidum* cultures do not cause putrefaction; and that any cultures containing *pallidum*-like spirochætes, giving rise to odour and yet pathogenic, must be regarded as impure. Should putrefaction be caused, and the culture be non-pathogenic, there is no way to establish its *pallidum* nature.

From the foregoing I deduce the following:—

The first strict proof of the pure cultivation of *Treponema pallidum* was brought forward in 1911 by myself. To accomplish this end a specially devised anaerobic method was employed. Later investigators have secured growths of a pathogenic *pallidum* by simpler methods of cultivation; but certain proof of all exclusion of allied saprophytic species has not, in my opinion, been produced by them.

(II) THE CULTIVATION OF THE VIRUS OF RABIES.

In my previous communications² it was pointed out that the virus of rabies may be cultivated for many successive generations without losing its specific virulence when optimum conditions for its growth are provided, and that in such cultures one always finds a variable number of minute granular chromatin bodies as well as occasional pleomorphic elements. It was also stated that in very rare instances peculiar round or oval bodies, resembling a uninucleate organism, make their appear-

¹ A bibliography on this topic is appended.

² See the bibliography.

ance for a short time. This last phenomenon was observed only four times within eighteen months, during which period at least fifty series of attempts at cultivation of the virus were made. In order to emphasize the rarity of the phenomena it may be well to explain the extent of the work. Each series of experiments is carried out in twelve tubes, each containing a piece of fresh tissue and the virus, six control tubes provided with fresh non-rabic tissue, and one tube containing salt solution or bouillon as well as the virus. Of these tubes each set of

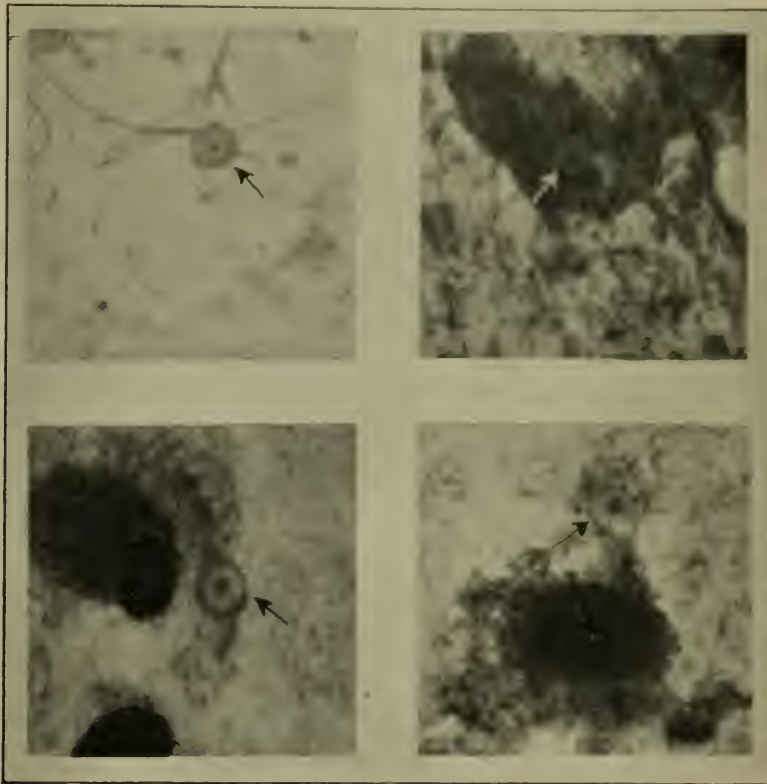


FIG. 1.

Bodies with central dots found in film preparations of the brain of dogs which died of street virus. They represent some of the bodies described by Negri. Giemsa stain. ($\times 1,100$.)

four received the same specimen of ascitic fluid, of which there are three different specimens¹ to be tried. Each two tubes of the control set also receive one of the three different ascitic fluids in turn. After the distribution of the ascitic fluid (10 to 12 cm. deep) one-half of the tubes are covered with a layer of sterile paraffin oil, and then placed in the

¹ If we want to try more specimens of ascitic fluids the number of the tubes must be increased accordingly, and vice versa.

thermostat at 37° C.¹ Microscopical examinations are made every three days until about ten or twelve days have passed, after which the cultures may be examined less frequently. A transfer is made into new tubes on the seventh and twelfth days. The second and subsequent generations so prepared are likewise controlled by periodic microscopical examination. For the determination of virulence, rabbits and guinea-pigs, and

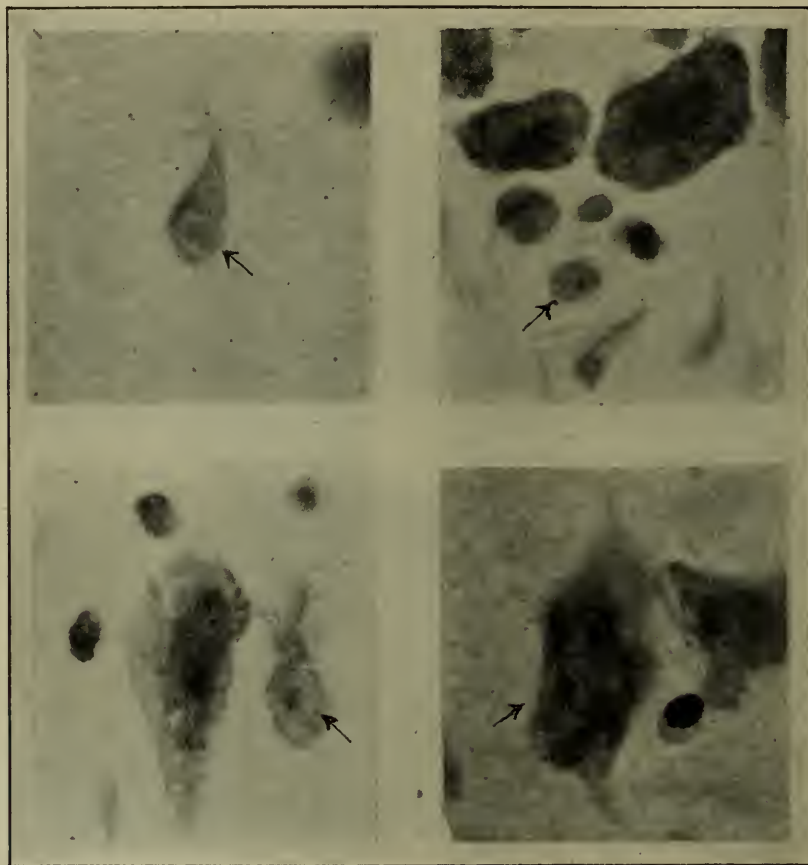


FIG. 2.

Bodies with central structure found in the sections of brain of dogs which died of street virus. They are known as Negri bodies. The tissue was fixed in sublimate alcohol (2 : 1) and stained by Mallory's eosin-methylene blue method. ($\times 1,100$.)

occasionally dogs, are inoculated intracerebrally, or intramuscularly, or sometimes intraocularly, with the cultures at different periods of cultivation. For the microscopical examination of cultures a minute quantity

¹ Recent experiments have shown me also that the cultivation can be carried out with an anaerobic apparatus, and that a positive result may be had quite regularly. A comparative merit between the series cultivated with and without the anaerobic apparatus will be discussed in a later publication.

of the fluid is drawn from near the bottom with a sterile capillary pipette, and spread on a slide, air-dried, fixed in methyl alcohol for thirty to sixty minutes, and then stained with the diluted Giemsa solution (1 : 10) for one to two hours, or sometimes overnight.

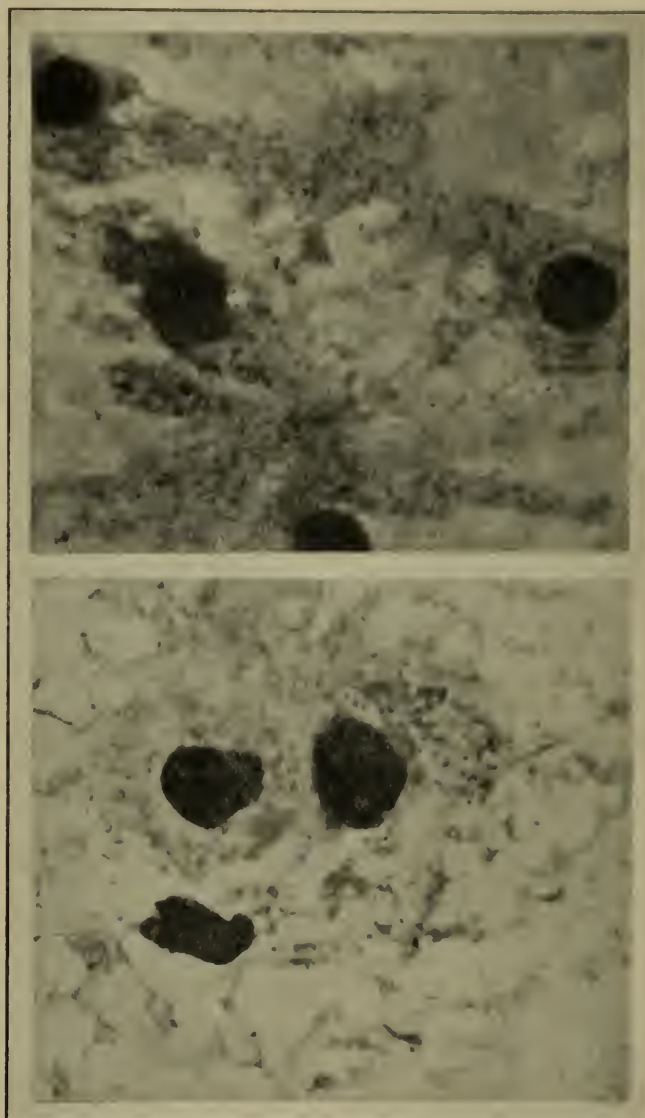


FIG. 3.

Minute granular and pleomorphic chromatin bodies found in film preparations of the brain of rabbits which died of fixed virus. They can be stained by Giemsa's solution, but not always successfully. ($\times 1,100$.)

For the purpose of cultivation both an emulsion and a untrituated piece of the brain (rabbit, guinea-pig, or dog with rabies) were used, but as no success was obtained with the former the latter was used exclusively in the majority of experiments. In transferring the cultures

from tube to tube only the fluid around the tissue is taken, although in the first generation a small particle of the brain substance may be contained in such fluid. The amount of the fluid transferred in each generation is 0.5 c.c. to 10 to 12 c.c. of the new media.



FIG. 4.

Bodies with central dots found in film preparation of a virulent culture (fourth generation) of a strain of fixed virus. Giemsa stain. ($\times 1,100$.)

The general plan of cultivation having been stated, I will now discuss the results which have been obtained. Out of fifty series (carried on until August, 1913), nine series were discarded on account of accidental bacterial contaminations. Of the remaining forty-one there was no

growth whatever in twenty-two series, and these became non-virulent at the second or third generation, within fourteen to twenty-one days. The other nineteen series yielded more encouraging results. Of the latter, eleven pertained to the fixed virus and the cultures remained virulent seven times to the fourth generation (twenty-eight days, with resultant dilution 1 : 160,000); three times to the fifth generation (thirty-five days, with resultant dilution 1 : 3,200,000), and only once to the seventh generation (two months, with resultant dilution 1 : 1,280,000,000).

The eight other series pertained to the passage virus which lost its



FIG. 5.

Bodies containing numerous minute granules found in a virulent culture (third generation) of a strain of fixed virus. Dark field illumination. ($\times 1,100$.)

virulence in the generation between the third and sixth generations (within two months), except in one instance where the twenty-first generation (seven months) still proved to be virulent.

A few protocols of successful reproductions of rabies by means of the cultures may be introduced here :—

PROTOCOL 11.

Culture from Passage Virus "Poor A," fourteen days old on its sixth generation.

Dog, fox-terrier.—August 9, 1912: 0·5 c.c. of the culture given intramuscularly. No symptoms until September 1, when typical symptoms (paretic) appeared. September 4, 1912: The animal died in twenty-eight days. Histological examination: Negri bodies positive;

perivascular infiltrations in the brain. Animal inoculations to a dog, rabbit and guinea-pig gave the following results:—

(a) Dog, mongrel.—September 6, 1912: 4 c.c. of the brain emulsion given intramuscularly. November 1, 1912: Became affected in the usual manner; the animal showed paretic symptoms forty-three days. November 4, 1912: Death took place in sixty-two days. Histological examination: Negri bodies positive; marked perivascular infiltration.

(b) Rabbit No. 60.—September 6, 1912: 0.1 c.c. of the brain emulsion given intracerebrally. September 30, 1912: Death after typical symptoms in twenty-four days. Histological examination: Negri bodies found.

(c) Guinea-pig No. 55.—September 6, 1912: 0.1 c.c. of the brain emulsion given intracerebrally. October 5, 1912: Death after twenty-nine days with regular symptoms. Histological examination: Negri bodies present.

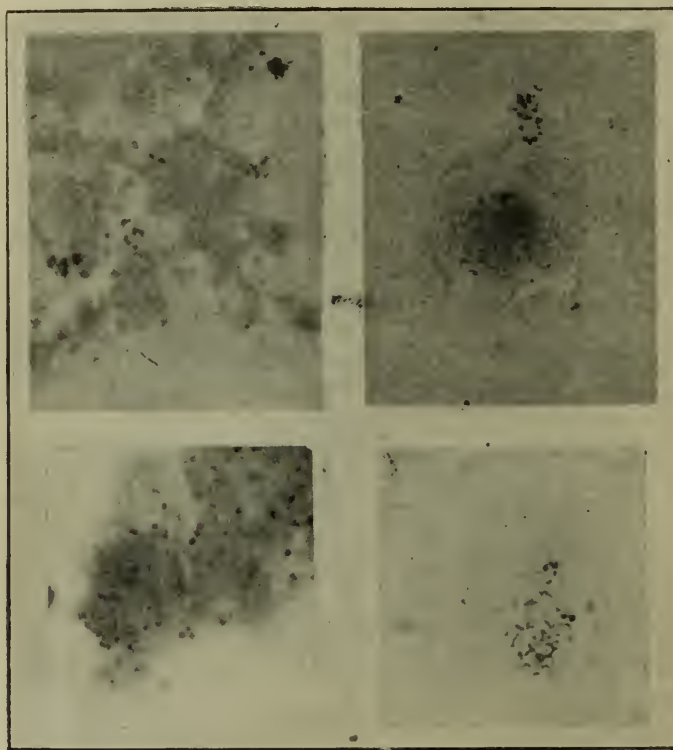


FIG. 6.

Minute granular and pleomorphic bodies found in virulent cultures of passage and fixed viruses. Giemsa stain. ($\times 1,100$.)

PROTOCOLS 17-18.

Culture from Fixed Virus "Poor I," five days old on its seventh generation.

Rabbit No. 81.—August 9, 1912; 0.1 c.c. of the culture intracerebrally. August 15, 1912: Paralyzed and died in the evening, being six days after the inoculation. Histological examination: Difficult to find Negri bodies. From this animal transmission was made to—

Rabbit No. 82.—August 15, 1912; 0.02 c.c. of the brain emulsion. August 21, 1912: Paralyzed. August 23, 1912: Death in eight days. From this animal transmission to—

Rabbit No. 82A.—August 23, 1912: 0.1 c.c. of the brain emulsion intracerebrally. August 30, 1912: Death, with regular symptoms, seven days after the inoculation.

PROTOCOL 30.

Culture from Fixed Virus "Reichel," seven days old on its fourth generation.

Rabbit No. 91.—November 9, 1912: Intracerebrally 0.05 c.c. of the culture. November 16, 1912: Death, with paretic symptoms, in seven days. From this animal transmission to—

Rabbit No. 93.—November 16, 1912: 0.1 c.c. intracerebrally. November 23, 1912: Marked symptoms in seven days. November 26, 1912: Killed by ether anaesthesia before death.

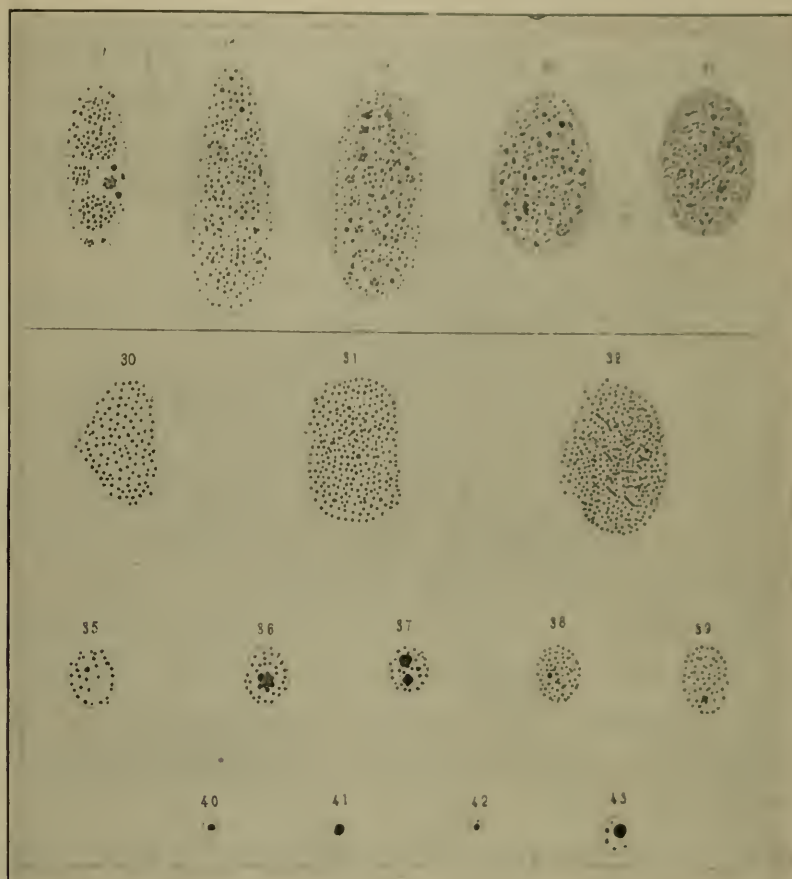


FIG. 7.

Negri bodies stained with Romanowsky-Giemsa solution. Reproduction from the drawings of A. Negri (*Zeitschr. f. Hyg. u. Infektionskr.*, 1909, lxiii, p. 421).

PROTOCOLS 40-40A.

Culture from Fixed Virus "Poor II," thirteen days old on its twenty-first generation.

Rabbit No. 104.—January 29, 1913; Intracerebrally 0.01 c.c. of the culture. February 3, 1913: Paretic. February 5, 1913: More advanced, moribund; killed by ether anaesthesia in seven days. Transmission to—

Rabbit No. 105.—February 7, 1913: Intracerebrally 0.01 c.c. of the brain emulsion. February 15, 1913: Death, with typical symptoms, in eight days. Transmission also to—

Rabbit No. 106.—February 7, 1913: Intracerebrally 0.001 c.c. of the brain emulsion. March 31, 1913: Death, with regular paretic symptoms, in fifty-two days. Histological examination: Negri bodies and perivascular infiltration present.

PROTOCOL 90.

Culture from Passage Virus "Neal I," seven days old on its fourth generation.

Rabbit No. 246.—April 25, 1913: Intracerebrally 0.01 c.c. of the culture. June 28, 1913: Death, with paretic symptoms, in sixty-three days. Histological examination: Negri bodies numerous; perivascular infiltration. Animal inoculation to—

Guinea-pig No. 251.—June 28, 1913: Intracerebral 0.1 c.c. of the brain emulsion. July 14, 1913: Paresis. July 16, 1913: Death in eighteen days. Histological examination: Negri bodies and perivascular infiltration present.

The pathogenic property of the fixed virus does not seem to suffer any marked modification, since the cultures when used in sufficient quantities (0.1 to 0.01 c.c.) killed the rabbits within six to eight days, while that of the passage virus cultures varied to some extent from the original, proving fatal in some instances as early as one week or sometimes as late as sixty-three days after the inoculation.

The fact of my not having been able to obtain a more uniform result is undoubtedly to be ascribed to the imperfect method of cultivation employed in the present work, and the chief defect of the method probably lies in the unsuitable quality of some of the ascitic fluids used. That this latter fact may constitute the most serious cause of failure was shown in the cultivation of different varieties of pathogenic blood spirochaetes and the virus of poliomyelitis.

The morphological elements found in these virulent cultures were, as reported elsewhere, minute granular and pleomorphic bodies not unlike those described by previous investigators (J. Koch, Babes, Proescher, &c.). In addition, peculiar uninucleate bodies of varying size were seen a few times. I have described them as of special significance, inasmuch as they were found only in virulent cultures and bear very close resemblance to the specific cell inclusions in the brains of animals which have succumbed to rabies. Throughout the studies on spirochaetes, vaccinia, poliomyelitis, hog-cholera, scarlatina, &c., for which similar culture media containing fresh tissues, ascitic fluids, nervous tissues, &c., are being used, I have never observed the bodies described here, although innumerable microscopical preparations of different cultures and controls which had not been inoculated with the virus of rabies had been examined day after day.

It may not be out of place to show here a few photomicrographs of the morphological elements found in the virulent cultures of rabies and some cell inclusions (also outside of the nerve cells) found in the brains of the animals which succumbed to rabies.

The cultivation of the micro-organism of epidemic poliomyelitis

has been likewise accomplished by methods similar to those already described in the foregoing part of my paper. As reported in our previous articles,¹ we have isolated a minute, strictly anaerobic, globoid micro-organism from the materials derived both from the human and the experimental poliomyelitis (monkeys). Some of these minute globoid bodies are so small as to pass through the pores of Berkefeld filters N and V, and in one instance they remained virulent for the monkey after the twentieth generation in artificial media. On the other hand, we experienced a rapid and often a sudden attenuation of the virulence in many instances. Here, as in the cases of other strictly parasitic varieties of microbes which frustrated our previous efforts at cultivation, the success of the cultivation is still extremely variable.

(III) THE ÆTIOLOGY OF THE SO-CALLED PARASYPHILITIC CONDITIONS.

While the statistics of various clinicians show that general paralysis and tabes develop in persons who have suffered from syphilis, no conclusive evidence has hitherto existed to show that they are a true syphilitic affection. The cytological, biochemical and serological discoveries have, however, made the intimate relation between syphilis and so-called parasyphilis more probable than ever, though not conclusive, because the demonstration of the causative agent of syphilis was not accomplished. Thus, we faced a paradoxical situation—namely, that in parasyphilis certain phenomena indicative of active syphilitic processes occurred without the syphilitic organism being demonstrated in the affected organ. The observations of Alzheimer, Mott, Nonne, Fournier, Régis, Krafft-Ebing and others on the juvenile form of general paralysis and its close relationship to parental syphilis, along with the simultaneous existence of paretic and syphilitic lesions in certain cases reported by Zambaco, Westphal, L. Meyer, Binswanger, Hübner, Sträussler, and others rendered the syphilitic nature of these conditions more probable.

Thus, it will be seen that the solution of the vexed question of the relation of syphilis and parasyphilis depended solely upon the finding of *Treponema pallidum* in the lesions. Much time and labour have been devoted to this end by various investigators since the epoch-making discovery of Schaudinn and Hoffmann, but unsuccessfully.

In spite of these failures, in themselves discouraging, I was led by the observation that *Treponema pallidum* sometimes assumes a granular

¹ Flexner and Noguchi (see bibliography).

form in cultures to re-study sections of paretic brains stained for the *pallidum*. The search was made exhaustively, since I was determined to study all kinds of granular particles which could be identified with the granular forms of the *pallidum* as found in the cultures. After studying 69 out of 70 preparations a spirochæta caught my eye—just at the moment when I was about to give up the search as hopeless, since I could not make up my mind as to whether the granules in the preparations were the granular forms of the *pallidum* or precipitates. One typical spirochæta out of 70 preparations was, however, sufficient to compel me to go over all the sections repeatedly, with the result that typical *pallida* were demonstrated in 12 out of 70 cases. These findings were published in conjunction with Dr. J. W. Moore in February, 1913.

Immediately afterwards 130 more paralytic brains were studied, in which *pallida* were demonstrated in 36 additional cases of this series, thus giving positive findings in about 25 per cent. when both series were calculated together (48 in 200 cases). The dark-field illumination was employed with fresh brains in six instances, and in one of the six cases *pallidum* was demonstrated. The use of the dark field is recommended whenever a fresh specimen of brain is to be examined, since it allows a rapid search for the *pallidum* over different localities of the specimen.

These results were soon confirmed by others. Thus, Marinesco and Minea reported one positive finding in 26 cases by the silver method; then Marie, Levaditi and Bankowoki three positive in 14 cases by the silver impregnation, all positive in six cases, which had died during fits, by means of Burri's "tusch" method, as well as the dark-field microscope; Forster and Tomaszewski, 19 positive in 25 cases in which the materials were taken out of the patients by means of Neisser-Pollak's puncture and examined by means of dark-field illumination. Forster and Tomaszewski observed active movements of the organism. Versé, Mott, Berger, Geber, Benedek and Tatár also reported positive findings.

The relation of the *Treponema pallidum* to the tissue elements of the affected brains may be stated briefly to be a progressive spirochætosis of the brain, affecting chiefly the cortical layers, and varying in dimension and localization according to the stages of the disease. In spite of diffuse cellular infiltration the *pallida* have been demonstrated in the pia only a few times. The nerve cells are often seen to contain one or more spirochætæ, while the wall of blood-vessels is seldom seen to be invaded. The presence of the *pallidum* in the parenchyma may explain many of the histo-pathological alterations, as well as clinical manifestations observed in the disease. The new formation of capillaries

associated with increase in the supporting glia constituents and atrophy of the nervous elements, as well as the infiltration of the vessel walls, must be ascribed to the activities of the spirochætes, although the intensity and character of the lesions may be modified through the existence of an anaphylactic state, as suggested by McIntosh and Fildes in a recent publication.

Treponema pallidum has also been demonstrated in one of the twelve specimens of spinal cords from the cases of tabes, where it was



FIG. 8.

Treponema pallidum in the cortical layers of the brain of a general paralytic. Stained by the silver impregnation of Levaditi (with slight modification.) ($\times 1,100$.)

found in a sparse number around the nerve cells near the posterior horn. A positive finding was reported also by Versé in two cases of tabes.

The biological properties of the *Treponema pallidum* found in general paralysis are of considerable interest. Those who maintain the syphilitic theory of general paralysis and tabes mostly emphasize the benign character of the infection during the primary and secondary stages. They are inclined to think that the organism which later affects the central nervous system in some way has specific affinity for the latter.

The oft-quoted instances reported by Brosius, in which several glass-blowers infected from the same source later developed either paresis, tabo-paresis, or cerebrospinal lues are familiar. Whether there is a *virus nerveux* among the *pallidum* strains is important from a practical standpoint, but up to date no exact investigation covering this point has been made.

In order to determine, first, the infectiousness and then the properties of the spirochæta found in the brains in general paralysis I have undertaken a series of experiments to transmit the spirochætes directly from paretic brains to the rabbit. Thirty-six rabbits were inoculated with the emulsions of six different fresh specimens of paretic brains. Two of the six inoculated with the material derived from one of the cases developed, in the course of 97 and 102 days respectively, small but typical induration in the testicular parenchyma and scrotal skin. In the first instance the spirochætes were extremely few in number, while in the second they were present in abundance. The development of the lesions was unusually slow when compared with the transmissions made from usual chancres or secondary lesions in this animal. In the latter instances the lesions appear usually within four to six weeks, seldom as late as two months. The second generation of this strain (paresis) also gave rise to rather small and only slightly indurated lesions in one of four rabbits by testicular inoculation. The incubation period was again nearly three months. My experiments have thus been limited to a small number of brain specimens (six), but have nevertheless shown the infectiousness of the spirochætes present in paretic brains, and hence established their virulence as low for the rabbit.

Nichols and Hough have also produced syphilitic keratitis in the rabbit by means of intratesticular inoculation of the emulsion of a paretic brain. They have, however, failed to find the *pallidum* in the lesion, but the keratitis lesion was transmitted to a subsequent series of rabbits. Graves has reported success in producing not only keratitis but also skin papules in the prepuce of rabbits by inoculating the blood of paretics. The data so far available do not permit us to draw any conclusions in regard to the existence of a strain specific for the central nervous system, but they determine the infectiousness of the organism found in general paralysis.¹

¹ Nichols has made a highly significant observation on a strain of *Treponema pallidum* transmitted from a case of "Neurorecidiv" to the rabbit (Nichols and Hough), to the effect that it exhibits an unusual invasive property in rabbits. This characteristic is suspected by him to enable such a strain to establish itself more readily in the central nervous system, leading eventually to syphilis of these organs.

The cause of the long interval between the time of the primary syphilitic infection and the development of parietic symptoms—averaging eight to twelve years—is still unsolved. Between the latency and the pathogenesis of paresis there may be some definite relation. Why does cerebral or cerebrospinal lues appear much sooner than so-called parasyphilis? I am not aware of any satisfactory solution to this question. Regarding this I may quote briefly certain experimental results recently obtained. The central nervous system of monkeys and rabbits is highly refractory to the syphilitic infection, even when the virus is directly introduced into the cerebral substance. Most of the animals remain perfectly well for an indefinite period of time after the intracerebral inoculation of the *pallidum*. Probably these animals require a previous sensitization before the *pallidum* can be made to infect the brains. For this reason I have treated animals with repeated intravenous inoculations of the killed and living *pallidum* during five months, and then after a recess of five months made an intracerebral inoculation of an emulsion of a subdural insertion of a minute piece of testicular syphiloma (rabbit) rich in the *pallida*. Twelve rabbits composed this series of experiments. Four normal (young) rabbits were similarly inoculated with the same materials on the same day and served as controls. All the animals remained apparently well for two months, when some of the sensitized animals became stuporous, inactive, emaciated, and showed a definite spasticity of the lower limbs and slight ataxia. The pupillar reactions were of no use for diagnosis, as they are normally often unequal in size and slow in responding to the light stimuli. The manifestations progressed steadily in the sensitized animals. They became unable to jump after three to five months. Their sera, originally giving negative Wassermann reactions, showed in some definite positive reactions. During the same period the control animals all remained active, except that some of them lost in weight. None showed a positive Wassermann reaction. The animals were sacrificed (under ether anæsthesia) one after another within a period of from three to five months, in order to examine the brains. It is impossible here to describe the findings in detail, but I may simply state that among the brains of the sensitized animals I found diffuse non-purulent exudative meningitis three times, a marked unilateral atrophy of the frontal lobes once, diffuse firmness of the cerebrum twice, and a few minute patches, about 2 by 2 mm., of yellow colour (plaque jaune) in the temporal region once. Dark-field examinations revealed no *pallidum*, but since the specimens were not extensively examined,

in order to save them for histological studies, I attach no importance to this point. The sections stained by the silver impregnation showed in one brain numerous granules and a few well-defined spirochætes. In others the *pallidum* could not be found. The sections from several animals stained with toluidin blue or hæmotoxylin-eosin revealed a marked endothelial proliferation and perivascular infiltration not unlike specimens of cases of human paresis. In some localities glia cells were increased, while most of the nerve cells appeared intact. The brains from the control animals revealed no changes in the capillary vessels, although in one instance a diffuse lymphocytosis throughout the cerebrum was observed. The above experiments are not without interest in the interpretation of the pathogenesis of general paresis, since they indicate that a previous sensitization renders the central nervous system of otherwise refractory animals vulnerable to the invasion of *Treponema pallidum*.

The actual presence of *Treponema pallidum* in the parenchymatous tissue of the central nervous system sufficiently explains the progressive and fatal nature of general paralysis. The inefficacy of the usual anti-syphilitic treatment against this condition would be explained by the peculiar localization of the parasites in the affected organs. Owing to the introduction of salvarsan we have witnessed a distinct advance in the treatment of these cases of so-called parasymphilitic conditions, but still greater benefit would accrue if we were to direct our main effort towards the prevention of the disease. By the term "prevention" I mean in this particular instance the checking of its occurrence before the *pallidum* invades the central nervous system. In the majority of cases the invasion of the *pallidum* takes place (or at least becomes evident) after a long period of latency (eight to twelve years from the time of syphilitic infection). This long interval would give ample opportunity for the physician to detect the presence of a hidden focus of infection, not so much through the subjective symptoms as through certain objective signs presented by the patient. Of these we to-day possess at least two different means of detection—the Wassermann reaction and the luetin reaction. As is well known, the former is positive in about 50 to 60 per cent. of cases of latent syphilis, while the latter is positive in about 80 to 90 per cent. of the same class of cases. Since these two reactions, which indicate two entirely different biological phenomena in syphilis, do not run parallel, the chances of discovering a latent case are enhanced by the application of both methods. Neither must we overlook the great importance of detecting the existence of latent syphilis in

any person, for the reason that paresis and tabes too often develop in individuals who had no knowledge of the existence of infection and who had remained in apparent good health until their central nervous system became affected. The value of an early detection of latent syphilis has become very much greater since we have been in a position to subdue it more effectually than was possible in the pre-salvarsan era.

I have stated that the allergic state of the skin as revealed by the luetin test is almost constantly present in latent syphilitics. On the other hand, this condition is by no means general in paretics and tabetics, being present in about 60 per cent. of these cases only. The reverse is true with the Wassermann reaction. What is the cause of this discrepancy? I am inclined to think that in some paretics the allergic state, which existed during the latent period, disappears as soon as the *pallidum* enters the brain and multiplies there unrestrainedly and uncontrolled by the body of the patient, thus resulting in a de-anaphylactization. If this assumption is correct we should possess in the luetin reaction a means which may provide us with a clue as to the probable effect of treatment that may be expected in each instance. At all events a careful study of the relation of the skin allergy to the clinical aspects and the serological as well as biochemical conditions of the blood and spinal fluid in general paralysis and tabes would be highly desirable.

Syphilis—an inheritable, infectious disease—was known to pervade every branch of medicine, and through recent revelations it has definitely claimed the great chapter of parasymphilis in psychiatry. The stamping out of this scourge requires not only the most vigilant medical measures, but also the conscientious co-operation of the general public, who can only become aroused to the perils involved by means of a more adequate system of instruction.

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The Royal Society of Medicine.

March 23, 1914.

Sir FRANCIS H. CHAMPNEYS, Bt., President, in the Chair.

Anti-mosquito Work at Panama.

By Surgeon-General GORGAS.

THE PRESIDENT said it was not his intention to interpose between the Fellows assembled and the most interesting lecture which they had gathered to hear from Surgeon-General Gorgas. Still, courtesy obliged him to say a few words of welcome to the distinguished lecturer. Everyone in the hall knew, in the main, what his work had been; he merely wished to give their guest a hearty welcome on the following grounds: First, that his work was an object-lesson to the world, and especially to this country, so slow to encourage science. People would now, perhaps, begin to understand how the intimate acquaintance with the life-history of a gnat could change the map of the world. In a line of research in which our own countrymen had laboured so successfully, they rejoiced that this great piece of work, about to be described, should have been undertaken and accomplished by one of their American cousins.

MR. PRESIDENT AND FELLOWS OF THE ROYAL SOCIETY OF MEDICINE,—

I will attempt this evening to give some general description of the anti-mosquito work at Panama.

The Isthmus of Panama runs in a general direction east and west, and the Canal crosses the Isthmus from north to south, and is some fifty miles in length. The city of Panama is located at the southern end of the Canal, and is situated in the Tropics, about 8° north of the Equator. The United States has there leased an area of about 500 square miles from the Republic of Panama, extending for 5 miles on each side of the Canal, and for its whole length. Over this area the United States has sovereign jurisdiction. About two-thirds of this area is a broken, rugged, mountainous country, the remaining third low and marshy. For the past four hundred years this section has had the reputation of being one of the most unhealthy regions in the world. It is probable that here more white men have died from tropical diseases than at any other place within the Tropics; not as much from its naturally unhealthy conditions as from the fact that for the past four hundred years unacclimatized whites have here been congregated. Climatic conditions are not disagreeable. The rainfall is heavy, though not as heavy as in many other tropical regions. The temperature is warm, remaining about the same all the year round; though not so warm as most parts of the United States in the hot season. These conditions—the heavy rainfall, and the continuously warm temperature—made an ideal environment for the development of the two species of mosquitoes which transmit, respectively, yellow fever and malaria. Add to this favourable mosquito condition the presence of the unacclimatized white man, and you only need the addition of the malarial and yellow fever infection for the breaking out of the conflagration. Panama, on the average, for the past four hundred years has had a greater number of unacclimatized whites present than have been present during that period at any other point within the Tropics. Panama has not been so excessively unhealthy through any natural condition, but on account of artificial conditions due to commerce and routes of travel.

When the United States undertook the construction of a canal at Panama they knew that they would have to protect the working force against the diseases that had been so disastrous to our predecessors on the Isthmus during the preceding four centuries. The French com-

menced work on the Canal in 1880, we in 1904. During that time great advance had been made in our knowledge of tropical sanitation. It had been discovered that malaria and yellow fever were transmitted from one human being to another by the mosquito: malaria by the *Anopheles*, yellow fever by the *Stegomyia*; and that in nature, probably, these two diseases were transmitted only in this way. These discoveries enabled us to control entirely health conditions at Panama. If we had known no more about these two diseases in 1904 than did the French in 1880, I do not believe that we could have done any better than they did. It is a matter of great pride and gratification to me to know that the two chief workers in bringing forward these two discoveries were men of the Anglo-Saxon race—the one English, the other American. In my opinion, the effects of these two discoveries will be as far-reaching as those of any discoveries ever made in medicine, not even excluding the immortal works of Jenner and Lister.

On account of my four years' experience with tropical work in Cuba, immediately preceding, I was placed in charge of the health work at Panama. We at once proceeded to organize the sanitary and medical work in its various departments. At the beginning, yellow fever was the most pressing question. We knew that the two towns of Panama and Colon were infected with the disease, and that as soon as we began to bring in our force of unacclimatized labourers the disease would light up and spread. A few deaths from yellow fever occurred in 1904.

Health departments were established in the cities of Panama and Colon, and health officers appointed in charge of these departments. The city of Panama was divided into six inspection districts, each in the charge of a sanitary inspector. Each unacclimatized person in the district was required to report to the sanitary inspector daily. If he were sick the health officer saw him. In practice, the sanitary inspector hunted up the unacclimatized, or had a subordinate to do so. This was done in order that the ordinance might be the less burdensome to the people concerned. We found it an economical policy in dealing with the people to be as little arbitrary as possible. We never enforced an ordinance which gave personal annoyance or trouble if we could avoid it. We found it more economical in such cases to employ additional men, and do the work ourselves. This was the keynote of our sanitary administration: never to use arbitrary methods where the object could be accomplished in another way. It was impressed upon

all sanitary officials that they must accomplish their objects by courtesy and kindness, rather than by order. It is very surprising to an Anglo-Saxon, accustomed to our arbitrary police-court methods, to see how much can be accomplished with a Latin-American population by courtesy and kindness.

This particular ordinance was not so difficult to enforce as might at first appear. The native was immune to yellow fever, and the only unacclimatized persons were the white men who had been there a short time. The inspector soon came to know all these people personally. When a case of yellow fever was discovered, option was given the patient of either going to the hospital or remaining at his own home. If he elected to remain in his own home, the room or rooms agreed upon were carefully screened with wire netting by an experienced force from the Sanitary Department, at public expense. Only one entrance was allowed, and this was furnished with a vestibule door, and an officer of the Sanitary Department was constantly on duty to see that the door was always kept closed. No other details of sanitation were enforced with regard to the patient, as clothing and so forth were known to be non-infectious. If the patient died, no precautions were taken with regard to the body, as it was also known to be non-infectious. As far as the sick man is concerned, the quarantine could be relaxed at the end of the third day of the disease, as it is known that the mosquito cannot be infected by the sick man after the third day of the disease. But if the quarantine were relaxed the mosquitoes that had already bitten the sick man during the first three days might get out and become capable of carrying the disease. As soon as the case was terminated, the whole house was pasted up and made as tight as possible, and fumigated with sulphur or other suitable material. This was done with the hope of killing all mosquitoes that had become infected.

The *Stegomyia*, the yellow-fever mosquito, is very weak on the wing, and seldom leaves the building in which it is bred. In case some infected mosquitoes may have gotten into the contiguous houses, they were all fumigated in the same way. If the sick man elected to go to the hospital he was taken up to a carefully screened ward. We had our own hospital, which was manned and equipped in a first-class manner with all modern hospital necessities. The mosquito spends about a week in its larval stage, during which it is obliged to live in water. The inspector was required to get around his district once a

week, and inspect all yards and premises with regard to mosquito-breeding.

We had an ordinance making it a sanitary nuisance for a citizen to breed mosquitoes on his premises, and giving the chief sanitary officer power to fine and imprison. The inspector carried with him a force of men sufficient to abate on the spot any ordinary mosquito nuisance, such as water puddles, old cans, empty bottles, collections in roof gutters, &c. More permanent work, such as rendering mosquito-proof cisterns and barrels, taking down roof gutters, &c., was done by the construction force of the Sanitary Department. If the owner of the premises was obstinate and continually breeding mosquitoes, he was punished; but the Chief Sanitary Officer had the power of remitting at any stage of the proceedings. If the citizen abated the nuisance, the punishment was always remitted. By these methods in Havana yellow fever was entirely gotten rid of within eight months of their inauguration. In Panama the results were not so rapidly brought about. Our last case occurred in Panama in May, 1906, just two years after commencing work. The difference in the two instances in the length of time taken to accomplish the same results was due principally to difference in administrative methods. In Havana, the Chief Sanitary Officer was on the staff of the Military Governor, and reported directly to him. The Military Governor gave the Chief Sanitary Officer every possible support as to power for carrying out the agreed upon sanitary measures, and as to the necessary funds for this purpose, and never in any way interfered in the details of their execution. At Panama, everything was just the opposite. The malarial work was taken up on somewhat different lines, malaria being a country disease rather than a town disease.

As I have before mentioned, the canal stretches for 50 miles north and south across the Isthmus. Construction work was going on at all points along this line. We controlled a stretch of country 50 miles long and 10 miles wide. This was divided into twenty-five inspection districts, at the head of each of which was a sanitary inspector. In each one of these districts were located one or more villages, varying in population from 8,000 down to a few hundred. Through the rest of the district large numbers of small farms were located. In the villages the sanitary inspector carried out much the same measures against yellow fever as I have just described as being carried out in the cities.

The *Anopheles*, the malarial mosquito, for breeding purposes, prefers clear fresh water, in which grow algæ and grass. These substances give protection to the larvæ from the small fish. Two hundred yards is a long flight for the *Anopheles*. We therefore, in general, made that distance the limit of our mosquito work for the villages and isolated houses in the suburbs. All collections of water within this area, where possible, were drained. It was impressed upon the sanitary inspector that drainage was the all-important anti-malarial measure, and that he was the best inspector who relied most upon drainage. For drainage we used the open ditch, such as the ordinary farmer uses for draining his lands. In a tropical country, such as Panama, this ditch soon becomes grass grown, and a prolific breeding place for the *Anopheles*. It had to be cleared out every two or three weeks, which made it very costly. We therefore used it only as a temporary measure. Where broken rock was plentiful, the inspector deepened this ditch, and filled it with broken rock. This prevented the growing of grass, and in the long run was more economical than the open ditch. Another form of ditch was lined with concrete. Such a ditch requires little attention for its upkeep, and will last for years. In the long run it is more economical and effective than the other forms. We used it very generally for our permanent ditching. Another form was the subsoil tile. This, when suitable, is the best of all forms of drainage. It is permanent, economical, and enables a horse-mower to be used for keeping down the grass. The mosquito seeks brush and grass for protection against wind and sun. For this reason we kept the grass and brush cut for 200 yards around villages and suburban dwellings. When, for various reasons, drainage was not practicable, oil was used. The constant change caused by the construction work often destroyed our drainage systems. The mosquito larva has to come to the surface of the water to get air. Paraffin oil spreads upon the surface of the water, and when the larva comes up to get air it enters his breathing tube and smothers him. When we could not drain we used oil, and it was impressed upon the inspector that he should only use oil where he could not drain. At the maximum of our work we used about 1,000 barrels of oil a month. In ponds around the edge of which grass was growing, or on the edge of streams where the same conditions existed, oil could not spread. Under such conditions we used a larvicide which would dissolve in the water and kill the larvæ in the grass and algæ. We used about 200 barrels of larvicide per month.

The mosquito, after she bites the malarial human being, requires about a week or ten days before she herself becomes capable of transmitting the infection. If mosquitoes are numerous, a certain number will get into even the best screened buildings. This will be more particularly the case in barrack buildings, or railroad cars used as barracks, in which a large number of labourers sleep. The doors in such buildings are being constantly opened, and the screening broken. We found it very useful, under such circumstances, to kill each day all the mosquitoes which had gained entrance. The mosquito, after having become gorged with blood, finds it difficult to get out of such a screened building, and seeks dark places within the building in which to remain and digest its meal. We found the best method for killing the mosquito under these circumstances was by the use of a test-tube, in the bottom of which some material moistened with chloroform was placed. The mouth of the tube is placed over the mosquito, and in a few seconds she drops dead into the tube. This tube is better than striking with any kind of flapper. With the flapper you frighten off the neighbouring mosquitoes, and crush the insect so that it could not be recognized. With the test-tube you can catch all the neighbouring mosquitoes one by one, and the dead mosquitoes can be classified and counted. This classification and counting was done each day at the central office. It is obvious that the mosquito catcher does not catch all the mosquitoes each day. But he does get each day most of the mosquitoes in the screened building. Take any individual mosquito and there is very little probability of her surviving the process for ten consecutive days. Unless she does survive ten days, her period of incubation, she cannot convey malaria. This method with us has been successful in localities where no other kind of anti-mosquito work was feasible. In this fashion we have kept 300 men, in screened cars, located in a swamp for two or three months at a time, free from malaria. In the instance I have in mind 200 soldiers, living in tents, had just left the same locality, having had about 100 per cent. of malaria. We used this method whenever, from any cause, mosquitoes were numerous.

For the first five years we used prophylactic quinine in 3-gr. doses wherever we could induce the people to take it. No compulsion was attempted. It was furnished gratis, and made as convenient and attractive as possible. Pellets and solutions were placed on all the eating-house tables. We had some thirty dispensaries located along

the 50 miles of workings. Each of these dispensaries furnished anyone who applied with quinine. We had some thirty quinine dispensers constantly going around among the men while at work, so as to offer each man quinine each day. Printed matter was circulated explaining the advantage of taking quinine, and pointing out the method of its protection. In these ways we succeeded in getting about half of our force to take quinine daily.

In localities in which we had succeeded in entirely getting rid of mosquitoes, prophylactic quinine was gradually dropped. Prophylactic quinine is a most useful measure, but should only be used pending the putting into effect the more permanent anti-malarial measures. Every man sick of malaria was sent to hospital, where he was treated with much larger doses of quinine till he had recovered. This anti-mosquito work was not carried into effect all over the Zone. There were large areas where no one lived; these were entirely untouched. When our sanitary work was at its maximum it covered about 100 square miles out of the 500 in the Zone. This anti-mosquito work has cost about £80,000 per annum.

The Sanitary Department at Panama had many other functions besides its mosquito work. The principal of these was the care of the sick. In addition to the sum above mentioned, we spent some £220,000 per annum for our other work. This mosquito work cleared the Zone of yellow fever. In May, 1906, we had our last case! It has also brought malaria down to such proportions that it does not interfere with the construction work. In many towns malaria has been entirely eradicated. In 1906 our malaria was at its highest. We admitted to hospital in that year for this disease 821 out of every 1,000 of our employees. During the first eight months of 1913 we admitted to hospital at the rate of 47 per 1,000 per annum. During 1906 our death-rate from disease among our negroes was at its highest, 45·38. For the first eight months of 1913, on an annual basis, that had fallen to 5·41 per 1,000. During 1906 our death-rate from disease among our American whites was 10·96. During the first eight months of 1913 this rate had fallen to 2·48. During the first eight months of 1913 our death-rate, on annual basis, from disease among our 4,500 American women and children was 4·27 per 1,000. These figures indicate what general sanitation had accomplished.

The appearance of Americans on the Isthmus is the best evidence as to their health. They are vigorous, well nourished, and healthy in

appearance. They appear more like a farming population from the Dakotas than an aggregation of artisans and mechanics. This is an instance of an Anglo-Saxon population consisting of 10,000 men, women and children, being brought directly from the temperate zone to one of the most unhealthy locations in all the tropical world. Yet at the end of ten years there has not been the least impairment of health. The health-rates, as you see from the figures given above, are exceptionally good. All that has been done at Panama is to protect from the infectious diseases, principally malaria and yellow fever. This is evidence that it is the infectious, not the climatic, conditions that have heretofore caused the wilting away of the white man in the Tropics. Protect him from the infection, and he will thrive, no matter what exposure he has to climatic conditions. Our white men at Panama work out in the open, exposed to sun, rain, and wind, day in and day out, month after month, and year after year. What has been accomplished at Panama can be accomplished anywhere else in the Tropics. The expense is not large, nor the labour great.

I believe that we are on the eve of the occupation of the Tropics by the white man. The returns for labour in the Tropics are so much greater than in the temperate zone that there will be a strong desire, on the part of the white man, to settle there, as soon as it is appreciated that he can live there in as vigorous health as in the temperate zone. If this be so, then great civilizations, in the course of time, will develop in tropical regions. And if we could see into the future far enough we would see the great empires of men located in the tropic rather than in the temperate zone. I dream that when that period arrives sanitarians will look back, hazily, through the misty past, and perceive that the health work on the Panama Canal was the first event, on a large scale, that demonstrated to the white man that he could live, and work, and maintain health, in tropical regions

Major NOBLE (Panama Sanitary Commission) showed a number of slides illustrating the sanitary work at Panama.

Sir WILLIAM CHURCH, Bt., K.C.B., said it gave him great pleasure to respond to the President's suggestion, and propose a cordial vote of thanks to the lecturer. He thought all present had listened with extreme interest, and he hoped they would return their best thanks to General Gorgas for his kindness in coming to entertain Fellows of the Society.

Sir HENRY MORRIS, Bt., seconded the resolution with the utmost pleasure. What had struck him in listening to the most interesting lecture was the very calm, quiet, yet emphatic way in which it was delivered. Another point which impressed him was, that though it was based upon science, the work had been carried out with such eminent common sense and with such effective energy, that it redounded very largely to the credit of all concerned, the mechanical part as well as the scientific, without which such a feat could not have been accomplished at all.

The Royal Society of Medicine.

April 8, 1914.

SIR FRANCIS H. CHAMPNEYS, Bt., M.D., President, in the Chair.

Metallic Ferments : Their Bio-physical and Therapeutic Properties.

By Dr. PAUL FERREYROLLES.

Physician at the Thermal Hospital in La Bourboule.

MR. PRESIDENT, LADIES AND GENTLEMEN,—

For some years the bases on which pathology and physiology have been resting have completely changed. Human physiology has become a chapter of biology. It is now actually a part of physical chemistry, to which must be added medical dynamics, which are the study of forces or of conditions of equilibrium belonging to the normal functions of the human organism. These different sciences have shown that the natural and physico-chemical laws of biology are applicable to the whole kingdom of Nature, and that between man, animals, plants, and even minerals there exists a community of origin, of constitution, and of laws. The ultra-microscope has brought matter to a final analysis in Nature—whether man, animal, vegetable or mineral—namely, ultra-microscopic particles, most of them extremely mobile, separated from one another and characterized by what is called the colloidal state—a state which belongs, as Professor Landouzy has said, to a fourth part of all matter.

The colloidal state, of course, is far from characterizing all living material, but all living bodies, from the most simple to the most complex, are formed from material in the colloidal state. The colloidal state is a transition stage between the mineral, metalloid or metal and the living protoplasm, which constitutes proteid or albuminous material. Thus, according to the conditions of the *milieu* in which colloidal matter is placed, we see the beginning of the conditions of Life appear and manifest themselves, with phenomena mechanical, thermal, luminous or

electric. The study of the reciprocal actions of the colloids and the *milieu*, and of colloids between themselves, constitutes the basis of physical and biological chemistry and the basis of medical dynamics. To study all these facts it is necessary to define the colloids and their properties.

(A) PHYSICO-CHEMICAL PROPERTIES.

When examined by the ultra-microscope a human or animal serum, a mineral or natural water, shows first some granulations, big or small, movable or immovable, isolated or massed together. Secondly, some particles more or less brilliant and motionless. Thirdly, some free spaces without apparent structure, separating these different elements. The granulations are the colloids; to the brilliant particles has been given the name of crystalloids; and the free space in which they float is the *milieu*.

Dr. Graham, disposing these different elements in a vase, for dialysis—that is to say, in a vase with two compartments separated by a permeable membrane—remarked that the brilliant particles alone passed through the dialysing membrane, whilst the mobile granulations remained on the other side. He called the first crystalloids and the second colloids. As Graham deduced, the crystalloids were dissolved and were forming solutions synonymous with salts; while the colloids were not forming solutions but only suspensions. But to-day the limit between the colloids and the crystalloids is much less defined. Henri and Mayer have come to this conclusion: “The term colloid as opposed to crystalloid does not indicate a class of particular bodies. There are no colloids, but merely a colloidal state, as there is a solid or a liquid state.”

All the corpuscles which are to be found in the solvent (be it in the state of ions or in the state of molecules) are in a state of true solution. Those which form big solid fragments or little drops, visible to the eye or to the microscope, constitute suspensions or emulsions. There remains between these extreme limits a zone in which the body occurs in the liquid in fragments smaller than $1\ \mu$. The particles are no longer visible through the microscope, but as seen through the ultra-microscope they are called ultra-microscopic particles. We say that they are in a colloidal state, characterized by an *ensemble* of physical and chemical properties. A very large number of different bodies may be found in the colloidal state. We distinguish first the *natural colloids*—that is to say, according to Stodel, the bodies which do not dissolve themselves into the solvent, which do not suck it up—such as pastes, albumin and albuminoids, gelatine, gum, starch, &c.

They are to be found only in the colloidal state and do not exist in any other form in the human or animal organism or in plants. Secondly, the *artificial colloids* are hardly soluble in the liquid and do not let themselves be penetrated by it. This is the case with all the ultra-microscopic suspensions of insoluble bodies, such as the metallic colloids of Bredig or pseudo-colloids.

Let us now turn to the artificial colloids, the way they are prepared, their principal characters, their experimental study and their therapeutic properties.

Preparation.

To obtain these artificial colloids special manipulations are necessary.

(1) *Chemical Method*.—Slowly precipitate two salts in solution or a salt and an electrolyte. The body which is formed is in the colloidal state. The same occurs if we reduce a solution of the salt of a metal by a solid, a liquid or a gas; a colloid will be formed. In the same way we may dissolve a metalloid with a liquid and again precipitate it by an excess of water, while, as in the case of phosphorus, sulphur, and selenium, a very beautiful colloid is formed.

(2) *Electrolytic Method*.—Transmit through some water a current of electricity between platinum electrodes. Gold, copper, silver, the most varied metalloids, may be placed on the positive or negative electrode and will be transformed into the colloid state, the metal in suspension quickly giving a colour to the water.

(3) *Electric Method of Bredig*.—Between two metallic electrodes in water pass a current of 4 to 30 amperes under 110 volts; the electrodes are pulverized and one will obtain the pure colloidal solutions of Bredig, the metallic ferments of Robin.

(4) *Method of Dr. Svedberg*.—This consists in making volatile, metallic or metalloid threads by means of the electric spark in water.

(5) *Method of Lancien*.—This is of two kinds. M. Lancien first takes Bredig's solution, from which he automatically extracts and pulverizes the colloidal grains by electric sparking of very high frequency. Secondly, for some bodies this author prepares cathodes (metallic or metalloid) which he pulverizes and afterwards dissolves by high frequency. The solutions are made in water, oils, alcohols, &c. One obtains a microscopic grain that may be made visible by the ultra-microscope by means of iodine vapour.

(6) *Method of Mr. Crookes*.—Mr. Crookes takes a solution of peptone, 2 in 100 parts of water, then a solution of nitrate of silver containing 1 part of silver for 1,000 parts of water. He adds the second solution

to the first and produces the reaction. He then exposes the solution to light for a few hours, puts it afterwards in an oven during twenty-four hours at 100° F. and then filters.

The colloidal preparations obtained by chemical means are a little different from those obtained by physical means. The silver colloidal solution, for instance, prepared by physical means, is said to be purer and richer and to have much smaller granulations, a much more active surface, and consequently much greater therapeutic power. Colloidal preparations present themselves under the form of liquids with colours more or less bright—violet for gold, red-brown for silver, black for platinum and palladium, grey for mercury. Under the ultra-microscope they appear as little sparkling points animated with movements called Brownian.

Brownian Movement.—Each particle moves in a sort of tremor, without appearing to be influenced by its neighbours. Physicists, Gouy especially, have shown that these phenomena are not due to an external cause. Brown's movements, explained by Gouy and by Dubois and analysed by the latter before the invention of the ultra-microscope, exist not only in the living body but in inanimate bodies—in the gaseous inclusions of quartz, going back millions of years, as well as in the juice of a plant or in a drop of blood. It is a constant property of fluid in equilibrium.

Size of the Grain.—The incursion of these movements is without doubt dependent upon the nature of the colloids, and in every case it depends on the size of the grains, and it is in studying this incursion that one is able to determine their size. If one makes an ultra-microscopic cinematograph of a preparation containing 10 cgm. of metal-loids for 1 litre in a cell of $\frac{1}{400}$ mm., a series of pictures is formed, and the average displacement in 100 pictures measured. This gives the incursion of one grain and its average displacement per second, and by a series of calculations the size of the grain. A more simple proceeding, owed to Siedentopf and Zsigmondy, is to ascertain, when this is possible, the weight of dry substance in suspension in a certain volume of the solution, and the number of granules contained in the same volume. From this weight and this number it is possible to deduce the size of the granules, supposing that they have a spheroidal form.

Adsorption.—The finer the grains of the colloidal solution the greater will be its concentration and the greater its power of adsorption. This property has been particularly studied by Henri and Meyer. Bunsen has shown that, if plunged into water, a pane of glass (after being dried as carefully as possible) has its surface modified and covered

with a thin film of water, having $5/100,000$ mm. thickness and adhering so strongly to it that it must be heated to 500° to have the water drawn out. This is the phenomenon of adsorption. This question of adsorption has such importance in biological dynamics that I think it would be useful to speak a little on the subject. Zengon says: "Certain solid bodies adsorbed dissolved substances out of their solutions. Associations which have not the character of usual chemical combinations are produced between the adsorbent body and the adsorbed substance. The substance adsorbed may be a gas or an electrolyte in true solution, or a colloid. These phenomena of adsorption by solid bodies are connected with the surface extent of the particles of such bodies. Colloids, in the state of jellies, possess a considerable surface development, and are (as shown by a series of experiments), in consequence of their structure, endowed with a considerable adsorbing power. Again, the laws which regulate the adsorption by solid bodies are found again in the adsorption by the colloid jellies. Thanks to the works of Ostwald and of Van Bemmelen we know certain of the factors which intervene in the march of these phenomena of adsorption. If it is true that the chemical nature of the adsorbent body has great importance, the physical state of this body also plays a part in the production of those phenomena. They depend also on temperature and the nature of the concentration of the bodies adsorbed; on the state of its molecule in the solvent; on the solvent itself, and on the duration of the adsorption." This citation shows that the constitution of the colloid (cell of blood or of organs) and that of the solution play a great part in the variability of the phenomena of adsorption. These phenomena not only form the basis of the physical chemistry of nutrition, but also play a part in the mechanism of infection, of immunization, and in the different reactions which bring about hæmolysis, the production and action of agglutinins, precipitins, and the different elements of the serum.

Electric Sign.—The action of the electric current has also a very important part in the study of colloids. In 1892, Linder and Picton found that if an electric current is sent between two electrodes at the ends of a closed tube containing the colloidal solution, the colloid is removed from one of the electrodes to the other. The experiments of other authors have demonstrated that the speed of the transport depends upon the difference of potential and not on the amount or amperage of the current. The colloids are removed, some to the positive pole, others to the negative. Victor Henri, and Mayer have constructed a list of negative and positive colloids. The natural colloids, placed in an electric field, are removed to one pole

or the other. Starch and glycogen are negative. The lipoids, the suspensions of grease, and the lecithins are also negative. The immense majority of the albumins in their natural state are negative colloids. The pancreatic juice, the bile, and the biliary pigments are negative. Hæmoglobin is positive. The normal peritoneal liquid contains only positive globulins. The liquid coming from a tuberculous peritonitis, studied by Iscovesco and Monier-Vinard, contains negative globules. The pus of cold abscesses contains only negative colloids (Calvé and Iscovesco). The normal urine is a negative colloidal suspension. The urine of a diabetic contains positive colloids. Joltrain and Comandon have determined the electric sign of certain microbes. The treponema of syphilis, the coli bacillus are negative; the spirilla of recurrent fever, the trypanosomes of sleeping sickness are positive. The colloids of contrary sign are able to stabilize themselves reciprocally and the electrolytic solutions of different metalloids or metals may also produce the stabilization of colloids. The name *complexes colloidaux* is given to the combination of colloids of different sign or of several colloids having different physical or chemical properties. In using only this study of the interactions of colloids according to their sign, Iscovesco has been able to make a great number of valuable reports which have been used to explain certain phenomena: viz., the coagulation of the blood, the action of the gastric juice and of the pancreatic juice, and the action of serum on the pancreatic juice. But besides their positive and negative characters, colloids have been classified, according to the greater or less facility with which they lose their colloidal properties, into two classes, stable colloids and unstable colloids. The stable colloids cannot be precipitated except by a relatively large quantity of acid, whereas only a fraction of similar bodies is sufficient to precipitate unstable colloids. To utilize them for therapeutic purposes they are fixed by the addition of a very small quantity of stable colloid of the same sign. They get in this way a kind of immunity against electrolytes and poisons, and they are afterwards made isotonic for injecting purposes.

Catalytic Power.—The catalytic power is one of the most interesting properties of colloids. It is equally important from the chemical and the therapeutic points of view. A catalyser is a substance which, being formed in the terminal products of a reaction, modifies the rapidity of this action. Such an action is called catalysis. An infinitely small quantity of a catalysing colloid is sufficient to accelerate a reaction. The experiment is one of the most simple. The addition of a very small quantity of colloidal platinum to a bottle containing oxygen water

will release oxygen, sufficient to light a match. This may be repeated almost *ad infinitum* if you employ platinum in the proportion of 1 grm. in 70,000,000 litres of water. The catalytic action of these solutions and of inorganic ferments, as Bredig says, is stopped by the action of poisons, such as chloroform or hydrocyanic acid, or by salts precipitating their solution. In that respect the action of colloidal metals can quite be compared to the action of diastases and of natural colloids. It is evident that a remedy with such properties must have definite action.

(B) EXPERIMENTAL STUDY.

One of the first facts established by V. Henri and Gompel in their experimental study is the harmlessness or almost absolute harmlessness of the action of electric colloidal silver on animals, either by ingestion, or by subcutaneous, intravenous, intraperitoneal, or intrapleural injections. The treatment can be continued a long time with pretty strong doses, at least for metals with small grains. After a time metals with large grains may produce at first an elevation of temperature, and afterwards nephritis, according to Foa and Aggazzotti.

Bactericidal Action.—The electric colloidal metals have *in vitro* a very high antiseptic power, as shown in their effect upon the white or golden staphylococcus, pneumococcus, streptococcus, and colon bacillus. From this point of view the colloid mercury prepared by the electric method of Bredig and studied by Stodel, is much more active than the sublimate. The specific action of silver on *Aspergillus fumigatus* is reinforced by the colloidal state of the metal. *In vivo* the colloidal metals increase the resistance of animals to microbic infection. Rats and mice when injected with colloidal metals have more power of resisting pneumococcic injection. There is an elevation of the phagocytic coefficient—it is not because the leucocyte becomes endowed with new properties, but because in the serum some true specific opsonins are formed. Colloidal silver preserves rabbits from ten times the lethal dose of diphtheritic, tetanic, and dysenteric toxins. Even the phenomena of anaphylaxis themselves are influenced by colloidal metals. One can, without making them incur any risk, de-anaphylactize guinea-pigs, producing a state of anti-hypersensibility by injecting into their general circulation 5 to 10 cgm. of electro-argol.

Physiological Action.

(1) *Temperature.*—Sometimes it has been noticed in experiments that an elevation of temperature of from $\frac{1}{2}^{\circ}$ to 1° attains its maximum

from two to five hours after the injection, but with a return to its normal shortly afterwards. This temperature reaction would appear to be attributable to an inequality in the size of the grains of the solution.

(2) *Pulse and Artery Pressures*.—Slight temporary elevation of the blood-pressure. No modification in the pulse.

(3) *Blood and the Hæmatopoietic Organs*.—Colloidal metals may produce a temporary polynuclear hyper-leucocytosis which lasts two days, and is replaced by a mononuclear and eosinophile reaction. The reaction of the hæmatopoietic organs is shown by a myelo-leucocytosis of the marrow of the bones, and an intense macrophagocytosis of the spleen. According to Stodel there is no hæmolytic action if the solution is isotonic.

(4) *Metabolism and Nutritive Exchanges*.—The breathing quotient, the urea, uric acid, the total nitrogen—the nitrogen coefficient—the coefficient of nitrogen utilization, the urinary indoxyl, all rise during the two or three days following the injection of the metallic ferments, their absorption and elimination. Whichever way the colloidal metals are introduced, Henri and Gompel have always been able to locate them again in the blood, the humours and tissues of the organism, including the bowel, liver, spleen, heart, and kidney, with the exception of the cerebrospinal fluid. They can be found two or three days after the injection—they eliminate themselves by means of the bile, the pancreatic juice, and above all by the urine (Mayer and Stodel).

Colloidal Metals in Therapeutics.

Now that we have studied the colloidal metals and their physiological action let us turn to their indications and their therapeutic action.

(a) *Local Infections*.—In local infections, abscess of the breast, acute meningitis, cystitis, virulent pleurisy (pus), whereas in some cases it is superior to the usual methods, in other cases it does not give results very different from those furnished by various antiseptics. But in cases of bruises, suppurations, and wounds of the cranium, it will be found that the colloidal manganese can be employed with great success.

(b) *General Infections*.—Medical or surgical septicæmias—at the point of departure, local or general treatment. At the beginning of many acute, subacute and chronic diseases, which at a certain time of their evolution have infective characters, this treatment will be found to be more than justifiable. In the severe forms of infective disease with hyperpyrexial prostration or agitation, typhus fever, eruptive fevers, erysipelas, pneumonia or broncho-pneumonia, the death-rate

would be reduced, according to Robin, from 29 to 13 per cent. by the use of this treatment. The same holds good in puerperal infection, traumatic or operative septicæmias. It does not depend only upon the antiseptic power of colloidal metals, but also upon a more general action on the infective element or upon the infected organism.

One had thought at first that the catalytic power of colloidal metals would be able to give an indication of their therapeutic action, and it had been concluded that a palladium with a catalytic power of 250 ought to be much more energetic than colloidal silver of catalytic power 25, but it has not been found so. The view of Robin, who at one time believed that in principle it is not gold, silver, platinum or manganese which act, but rather material in the colloidal state, is in my opinion not correct. It seems to-day that the study of metallic ferments has advanced sufficiently for us to be able to establish for each of the metals a special indication according to their electric sign, and perhaps of their specific Brownian movements compared with the sign and movements of the invalid organism. In all the general infections of which we have just spoken colloidal silver is the best known and the most used in therapeutics. It seems to be well established to-day that it only gives undisputable results in certain defined streptococcal maladies. Colloidal mercury, studied by Stodel, has been successfully employed in intraspinal injections for syphilis of the nerves and tabes. Against cancer we use in France, after the experiments of Gaube du Gers, colloidal copper, which seems to have a specific action—at first, diminution of the pain, retrogression in certain cases of the tumour, which ceases to multiply, with amelioration of the general condition permitting sometimes longer life. MM. Lancien and Thiroloix have employed, after the results given by M. Wassermann, on cancerous mice by the ionized sileniate of soda, injections of electric colloidal silenium. The cancerous cell is an over-cultivated cell, and in consequence needs glycogen to enable it to live, but silenium presents in the organism a great affinity with glycogens. Hence it should stop the evolution of the neoplastic cell. In fact, one hears of pretty good results. The electro-palladium, on account of its enormous catalytic power, has been successfully employed by M. Paul Tissier in the cure for obesity. Dr. Guard thinks that colloidal silenium is specific in the hypertrophy of the thyroid. Colloid rhodium gives excellent results in the septicæmias. Quite lately, Dr. Robin and Dr. Maillard have published (on the action of colloidal sulphur) such surprising results obtained in chronic rheumatism, and confirmed since by the clinical facts of M. Guilloteau, that I am sorry I have not time to expatiate upon them.

When is it advisable to begin this treatment? Robin prescribes it from the beginning in pneumonia. Triboulet considers that the best time for the injection is at the commencement of defervescence when the leucocyte crisis, which they hasten and activate, is beginning. In every case it is wise not to delay too long in administering the remedy. One cannot revive the cardiac fibres, liver cells, or the urinary tubes when they have been destroyed. But we can provide the whole organism with means of local or general defence which will put these tissues beyond the reach of such a grave attack. Once the remedy has been commenced, it is advisable to continue it, even if it has already produced an immediate improvement. The re-ascent of temperature in a relapse would in all probability follow a too speedy cessation. One should be content with weak and frequent doses.

Mode of Action of Colloidal Metals.

Bredig and Robin have examined the reaction of the organism with regard to colloidal metals, comparing them to the diastases. The colloidal state is common to them both; many physical or chemical reactions can be similarly accomplished by them, and by an identical process. Their proper reactions are accelerated or delayed by the same agents, they are influenced in a similar manner by heat, both of them acting in an infinitesimal dose. Robin, moreover, has shown from the physiological point of view that ferments extracted from potatoes, or from diastase extracted from the yeast of beer, produce in the organism the same effects as the metallic ferments. Robin compares these ferments with certain substances which seem to act like diastase—anti-diphtheritic serum and normal serum of the horse, but he questions the diastatic property.

He also suggested that it was perhaps in virtue of their colloidal state that mineral waters acted. Special researches that have been made upon this point have demonstrated to me that Robin was quite right, and that many medicinal waters can be considered colloidal solutions. I am sorry not to have time to enlarge on this special subject. Dr. Fortescue Fox tells me that he hopes on another occasion to develop this subject for me. I trust, if you are interested, that you will refer to this work.

In reality, all colloidal methods that we have employed in acute diseases give only relatively small results in chronic diseases, whilst medicinal waters seem to produce in chronic diseases an effect which can be compared with colloidal action in acute diseases. They have been

especially studied from this point of view by Glénard and Salignat at Vichy, Foucault at Châtel Guyon, Debidour in Mont Dore, and by myself at La Bourboule. I have published a work on this subject, showing that in the water of La Bourboule can be found crystals, crystalloids and colloids. I believe them to be arsenical on account of the similarity of action which exists between colloidal arsenic and the water of Choussy-Perrière. We observe similar electric sign, similar toxicity, weaker than that of the arsenical compounds, similar catalytic power, similar bactericidal action, similar action on anti-anaphylaxis and general immunity.

(C) CONCLUSIONS.

The colloidal electric metals, with their physico-chemical, catalytic, bactericidal and diastasic properties, furnish us with one of the most interesting methods which have been introduced of late years among practical therapeutic remedies. Not only are they directed to the cause of the disease, anti-infective, but, following Nature, they act in infinitesimal doses, which is not the least important of their attributes. These agents—for which one cannot say as of certain others, that while they kill the microbe they weaken the patient—add to this antiseptic power the property of producing a more efficient reaction of the organism. To a favourable physical action, common to all colloidal remedies, which chiefly has been studied up to now, will have to be added the specific therapeutic action found in the chemical properties of each of them. Medicinal waters, true colloidal serums, have in chronic disease an action that corresponds to that of colloidal metals in acute diseases, with indications made much more precise by clinical facts.

The future, we hope, will give to the colloidal remedies the place to which they are entitled in therapeutics.

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FERREYROLLES et GASTOU. "Étude des propriétés bio-physiques des Eaux de La Bourboule,"
1912 (contains a general bibliography of the colloidal questions).

Dr. LYN DIMOND (Nottingham): I must thank you for your kindness in permitting me, a visitor, to say a few words with regard to my limited experience of the therapeutics of these interesting states of the metals. That all these metallic ferments, so called, are strong bactericidal agents there can

be no doubt. Two different colloids which I have tested with pyogenic and catarrh-causing organisms are Merck's 1 per cent. colloid mercury and Crooke's "collosal hydrarg." A 1 per cent. solution of Merck's colloid killed all the organisms tested within six minutes, that is to say in a dilution of 1 in 10,000; whilst the collosal hydrarg., a 1 in 2,000 solution, with a further dilution of 1 in 5, destroyed similar organisms in the same time. An interesting point is the fact that protection which is necessary in order to preserve these solutions has practically no effect upon their bactericidal powers, and when using unprotected colloids in a parallel series with those that were protected by one or other of the organic colloids commonly used for that purpose, practically identical results were obtained. As a result of frequent blood examinations following the injections of solutions of silver, mercury, platinum, gold and iron I have not been able to determine that there is any marked leucocytosis. In local inflammatory conditions, the study of the opsonic index usually shows a late rise followed by a slight fall, which may possibly be due to auto-inoculation as a result of the bactericidal effect of the colloid injections. At any rate there is little or no change in the index following colloid injections in the healthy subject. Merck's colloid mercury in bi-weekly doses of 1 to 3 c.c. intramuscularly, or the collosal hydrarg. from 2 to 5 c.c., gives excellent results following one or more doses of salvarsan or neo-salvarsan in cases of specific disease, and I usually continue this for six months or more until after a provocative injection of salvarsan the Wassermann reaction remains negative. A protected colloid of iron prepared for me through the kindness of Mr. Henry Crookes has proved to be a valuable preparation. It is definitely antiseptic, though not so actively so as the colloids of mercury, silver, or platinum, and undiluted will kill *Bacillus typhosus* and *Bacillus coli* within six minutes. As a topical application, as well as by internal administration, I have found it valuable in both local and general catarrhal conditions. The doses which I have found most useful have been from 2 to 5 c.c., and when administered hypodermically or by intramuscular injection in cases of chlorosis and in debility and anæmia following pneumonia, influenza, syphilis, surgical tuberculosis, &c., it is followed by marked increase of the hæmoglobin and red blood corpuscles. In cases of erysipelas and cellulitis this metallic colloid is almost specific and its hypodermic administration has a marked effect in bringing about resolution of the inflammatory symptoms and shortening the usual course of the disease. In pernicious anæmia no permanent results were obtained. Dr. Day, Physician to the Kasr-el-Ainy Hospital, Cairo, is at present using it in the treatment of the anæmia of ankylostomiasis. In addition to the therapeutic use of these colloids, colloid gold has been used to distinguish between different organic colloids by means of a test devised by Siedentopf and Zsigmondy, called the gold number. Applying this test to the colloid proteins of the cerebrospinal fluid, preliminary investigations seem to indicate that it may be an additional means of differential diagnosis of such diseases of the central nervous system as general paralysis of the insane, locomotor ataxy, epilepsy, &c.

"Proceedings" of the Royal Society of Medicine.

SUPPLEMENT.

NOTES ON BOOKS.

[The purpose of these "Notes" is neither to praise nor to blame, but merely to draw attention to the new books and new editions which have been added to the Society's Library.—ED.]

ANATOMY, DESCRIPTIVE AND APPLIED. By HENRY GRAY, F.R.S. Eighteenth edition. Edited by ROBERT HOWDEN, M.A., D.Sc., M.B., C.M. Notes on Applied Anatomy, revised by A. J. JEX BLAKE, M.A., M.B., B.Ch., F.R.C.P., and W. FEDDE FEDDEN, M.S., F.R.C.S. With 1,120 illustrations, of which 431 are coloured; pp. 1328. Price £1 12s. net, large 8vo. London: Longmans, Green and Co., 1913.

The distinguishing feature of this new edition of "Gray" is the use in the text of the Basle nomenclature. The editor, however, has adopted English translations of the Latin terms throughout, save in those instances where the Latin terms have become fixed by routine usage. For the purposes of comparison and convenience of reference, a threefold glossary is appended at the end of the volume showing (a) the terms adopted in the text, (b) the Basle, and (c) the old terminology. Another change noticeable in this new edition is the rearrangement of the paragraphs on surface anatomy. These paragraphs, instead of being scattered about appended to the descriptions of the various structures, are now collected and form a separate chapter. The whole text has been thoroughly revised, and upwards of two hundred new engravings have been added, the majority of which have been drawn from original preparations.

MODERN OPHTHALMOLOGY. A Practical Treatise on the Anatomy, Physiology, and Diseases of the Eye. By J. M. BALL, M.D., LL.D. Third edition, revised and enlarged, with 445 illustrations in the text and numerous figures on 24 coloured plates; pp. xxv + 911. Price £1 11s. 6d. net, 8vo. Philadelphia: F. A. Davis Company, 1913.

Some changes have been introduced and much new matter has been incorporated into the third edition of this work. A feature not generally considered by ophthalmic surgeons is discussed in a new chapter entitled "The Legal Relations of Ophthalmology," contributed by Dr. Shastid. The chapters on "Anomalies of the Muscular Apparatus," "Ocular Symptoms of Nervous Diseases," and "Diseases of the Orbit," have been subjected to careful revision, and a noticeable change in the section devoted to "Refraction" is the introduction of the subject by two new chapters, "Elementary Optics" and "Normal Ocular Refraction" respectively. For the rest, beyond the general revision of the work, this new edition does not materially differ from the previous one. A copious index completes the volume.

THE NEWER PHYSIOLOGY IN SURGICAL AND GENERAL PRACTICE. By A. RENDLE SHORT, M.D., B.S., B.Sc.Lond., F.R.C.S.Eng., Hunterian Professor and Examiner in Physiology, Royal College of Surgeons. Third edition, pp. xii + 256; 7½ by 5 in. Price 5s. net, small 8vo. Bristol: John Wright and Sons, Ltd., 1914.

The author's aim has been to gather out of the accepted facts of recent work in physiology all that appears to be useful to the general practitioner and to the surgeon in their daily work, and to present it in simple, non-technical language. In this edition such considerable

changes are introduced that readers of the first edition, published in 1911, will find that about one-half of it is new; and that it differs from the second edition in containing two new chapters on vitamins and the genital glands. The articles on surgical shock, the digestive apparatus, the pituitary and pineal glands, and on chloroform poisoning, are largely rewritten. There are also considerable additions to the chapters on the thyroid gland and the physiology of the spinal cord.

SOME MINUTE ANIMAL PARASITES, OR UNSEEN FOES IN THE ANIMAL WORLD. By H. B. FANTHAM, D.Sc.Lond., B.A.Cantab., F.L.S., and ANNIE PORTER, D.Sc.Lond., F.L.S. With frontispieces and 56 text figures; pp. xi + 319. Price 5s. net, small 8vo. London: Methuen and Co., Ltd., 1914.

This book is of the semi-popular type, having for its aim the simplification of the science relating to the protozoal organisms which produce disease. Care has been taken to explain fully the technical terms which have been used, and to repeat these explanations. So far as the science of protozoology is concerned the diseases of man, cattle, horses, poultry, game, fish, and bees are dealt with, among which may be mentioned sleeping sickness, malaria, dysentery, and kala-azar in man; tsetse-fly disease and redwater in cattle; coccidiosis in relation to domestic poultry and game birds; myxosporidiasis as affecting fish; and microsporidiasis in respect to bees and silkworms. These subjects form the bulk of the volume, while concluding chapters are added in elucidation of the more general aspects of protozoology, on "The Parasitic Protozoa in Relation to their Environment," "The Economic Importance of the Study of Protozoa," emphasizing the relation of these parasites to human disease, and their destructive effects upon food for man.

SPECTRUM ANALYSIS APPLIED TO BIOLOGY AND MEDICINE. By the late C. A. MACMUNN, M.A., M.D., with a preface by Professor F. W. GAMBLE. With illustrations; pp. xi + 112. Price 5s., 8vo. London: Longmans, Green and Co., 1914.

From a note we learn that the publication of this book has been a labour of love on the part of the author's widow; and Professor Gamble tells us that owing to attacks of serious illness the author, during his lifetime, was unable to give to his book that revision which he had intended. The revision, therefore, and completion of the work for the press was entrusted to the hands of Dr. I. H. Milroy. The volume opens with a chapter explanatory of the prism as employed in spectroscopic work. Then follows a description of the chromatology of plants and animals. A variety of diverse subjects are discussed under this head, inclusive of colour vision, the colouring matter of plants, the action of light upon, and pigments of, seaweeds, animal colouring matters, the colours of deep-sea animals, of fishes, chlorophyll in the skin of horses, the chemistry of the pigments and of the melanins. More closely concerned with medicine is a chapter on "Hæmoglobin, its Components and Derivatives," and one on "The Pigments of Vertebrate and Invertebrate Bile and of the Urine." A full bibliography of general works on spectrum analysis and pigments, together with correlative works upon the subject, complete the volume.

CHRONIC COLITIS: ITS CAUSATION, DIAGNOSIS, AND TREATMENT. By GEORGE HERSCHELL, M.D.Lond., and ADOLPHE ABRAHAMS, M.D.Cantab. Pp. ix + 276. Price 6s. net, 8vo. London: Longmans, Green and Co., 1914.

"So far as we are aware," the authors say in their preface, "this is the first English manual that has appeared on this subject." In fulfilment, therefore, of their aim to supply the deficiency, the subject is discussed first from the two main aspects of causation and diagnosis, and secondly, treatment; and a short chapter is added dealing with the pathology of the disease. Mummery's classification is accepted as the basis of the pathological types, and the authors, in agreement with Mathieu's warning against the harm of daily lavage of

the intestine, affirm that "in their experience many cases of chronic colitis owe their origin and perpetuation to treatment at sulphur spas, imperfectly supervised or undertaken without special advice." Among the predisposing factors in the causation of colitis are mentioned scarlet fever, typhoid fever, and the acute exanthemata generally; among the causes are included constipation, intestinal infection, mechanical irritation, intestinal parasites, excretion of irritating material through the intestinal mucosa. The chapter in which the symptoms are discussed refers to their motor, sensory, mental, and visceral origin, and upon the question of diagnosis stress is laid upon the utility of examination of the *faeces*, a detailed description of which is added. The bulk of the volume is devoted to the subject of treatment—the main feature of this consists in pointing out the methods for regulating the diet; in furtherance of which directions are given by means of which a diet may be constructed for any particular variety and stage of colitis from which a patient may be suffering. Attention, among other matters, is drawn to the value of whey: "whey, the chief application of which in this country," as the authors affirm, "has been that in the fattening of pigs." An index of the authors' names quoted in the texts and a full index complete the work.

SENSORY AND MOTOR DISORDERS OF THE HEART: THEIR NATURE AND TREATMENT. By ALEXANDER MORISON, M.D., F.R.C.P. Pp. viii + 259. Price 7s. 6d. net, 8vo. London; Baillière, Tindall and Cox, 1914.

This book consists of three parts: (1) The nature of cardiac action. (2) The sensory disorders of the heart. (3) The disorders of cardiac motion—owing to anatomical and physiological research, and the introduction of additional methods of examination, both in the laboratory and at the bedside. The views respecting the nature of cardiac sensibility and motion have latterly undergone considerable change. The anatomy and physiology of the nodal system are first discussed by the author, together with, in succeeding chapters, the neural and mechanical factors in, and the nerve control of, cardiac action. A brief account is also added of the coronary circulation and of the cardiac blood, in which is recorded the results of some original investigations made by the author in 1902. The second part deals with cardiac pain from its pathological and clinical aspects—its diagnosis, prognosis and treatment. In the third part the various forms of tachycardia and bradycardia, extrasystolia, hypertonia and hypotonia are described. The author explains his introduction of the new term, "extrasystolia," by stating that the minute attention given in recent years to the study of cardiac irregularities has served to distinguish more precisely from one another varieties of arrhythmia, without regarding the maintenance or otherwise of the so-called sinus rhythm. The concluding chapters of the work deal with the prognosis and treatment of disorders of cardiac motion.

ANÆSTHETICS: THEIR USES AND ADMINISTRATION. By DUDLEY WILMOT BUXTON, M.D., B.S. Fifth edition, with 8 plates and 84 illustrations in the text; pp. xiv + 477. Price 10s. 6d. net, small 8vo. London H. K. Lewis, 1914.

The advances recently made in the special department of the anæsthetist are clearly shown by the changes incorporated in this new edition of the author's handbook. Most of the chapters have been re-written, obsolete apparatus and theories have been deleted, and the size of the volume increased by the addition of much new matter. Thus the procedures involved in giving nitrous oxide and oxygen in major surgery; of ether by the open method, by intravascular infusion, by intratracheal and pharyngeal insufflation, and by colonic absorption; the methods of local, regional and spinal analgesia, and the employment of alkaloids in analgesia and anæsthesia, have been fully dealt with and described in this new edition. In a concluding chapter the author discusses the various aspects from a medico-legal point of view of the administration of anæsthetics.

A PRACTICAL TREATISE ON MEDICAL DIAGNOSIS FOR STUDENTS AND PHYSICIANS. By JOHN H. MUSSER, M.D., LL.D. Sixth edition, revised by JOHN H. MUSSER, jun., B.S., M.D. Illustrated with 196 engravings and 27 coloured plates ; pp. viii + 793. Price 25s. net, large 8vo. London : Henry Kimpton, 1914.

The fifth edition of this work appeared eight years ago, and this new edition, edited by the author's son, has been practically re-written. Much new matter has been added in the sections on the infectious diseases, the diseases of the cardio-vascular system, the metabolic diseases, and those of the gastro-intestinal and urinary systems. The sections on laboratory diagnosis have been extensively revised, and a new chapter has been written on the various functional tests of organic efficiency.

GERIATRICS : THE DISEASES OF OLD AGE AND THEIR TREATMENT, INCLUDING PHYSIOLOGICAL OLD AGE, HOME AND INSTITUTIONAL CARE, AND MEDICO-LEGAL RELATIONS. By I. L. NASCHER, M.D. (New York), with an Introduction by A. JACOBI, M.D. With 50 plates, containing 81 illustrations ; pp. xiii + 509. Price 24s. net, 8vo. Philadelphia : P. Blakiston's Son and Co. (No date.)

The term Geriatrics, the author explains, is derived from the Greek—*γέρων*, old man, and *ιατρικός*, medical treatment. He believes that under this head a new branch of medicine might be formed, to which special study might be devoted. We learn, too, that this work is the first dealing with the subject which has appeared by an American writer. The author affirms that the object of his work is to arouse an interest in "Geriatrics" and stimulate research into the causes of senility and the pathology of senile diseases. By senile diseases he means those diseases which present different features in old age, as compared with earlier life. The classification which he adopts is (1) Primary senile diseases due to changes in the anatomy and physiology of the tissues ; (2) secondary ; (3) modified diseases of old age ; (4) preferential diseases of old age ; (5) diseases uninfluenced by age or which are rare in old age. Under this classification the various diseases are discussed, and the author draws attention to the stress which has been laid upon their treatment.

MECHANO-THERAPEUTICS IN GENERAL PRACTICE. By G. DE SWIETECHOWSKI, M.D. (Munich), M.R.C.S., L.R.C.P. With 81 illustrations ; pp. xiv + 141. Price 4s. net. London : H. K. Lewis, 1914.

The author of this work is connected with the electrical and massage department at King's College Hospital, and the main object of his small manual is to show general practitioners the value of mechano-therapeutics, a department of our art which is not compulsory in the curriculum, and is altogether, as he affirms, neglected by the medical schools. In some preliminary observations we learn that a couch and a pair of skilful hands are all that is really indispensable for the mechano-therapeutical treatment of patients from the point of view of appliances, and so "those who cannot rely on their fingers should leave massage alone altogether, rather than have recourse to vibrators, pulsators, and other similar instruments." Brief reference is then given to the indications and contra-indications of mechano-therapeutics. The subject matter which follows is descriptive of the application of the treatment in its surgical aspect, such as sprained joints, chronic arthritic conditions, chronic inflammatory conditions of soft parts, &c. ; in its medical aspect, such as the circulatory, respiratory, digestive, urinary, and nervous systems and systemic diseases ; in its special aspect, inclusive of gynæcology, otology and ophthalmology, dermatology, dentistry, and the nose and throat. In some concluding remarks the author observes that "it would be a greater benefit to the public, as well as a greater advantage to the profession, if the motto 'more medicine in massage, and more massage in medicine' were generally adopted."

AIR AND HEALTH. By DONALD CAMPBELL MACFIE, M.A., M.B., C.M. Pp. vii + 345.
Price 7s. 6d. net. London: Methuen and Co., 1909.

This volume is one of the latest of the "New Library of Medicine" now being issued by Messrs. Methuen, and, as indicated by its title, deals with the physical and chemical properties of air in relation to health and disease. Following a chapter on the physiological aspects of respiration, other chapters which may be mentioned discuss "Air Pressure in Relation to Life," "Temperature of the Air and Health," "Humidity and Thermolysis," "Humidity and Health," "Impure Air," "Polluted Air," resulting from smoke, fog, gases in mines, ground air, offensive gases from trades; "Dust and Germs," "Open Windows, Draughts and 'Colds,'" "Artificial Atmosphere." A concluding chapter is also devoted to the "Open-air Treatment of Consumption and Open-air Schools," in which the author emphasizes the statement that tuberculosis is often a disease of bad ventilation.

THE VACCINATION QUESTION IN THE LIGHT OF MODERN EXPERIENCE. AN APPEAL FOR RECONSIDERATION. By C. KILICK MILLARD, M.D., D.Sc. With diagrams and illustrations. Pp. xviii + 243. Price 6s. net. London: H. K. Lewis, 1914.

The author of this book is the Medical Officer of Health for Leicester, and the volume embodies the substance in amplified form of a course of lectures given in London, early in the present year, under the auspices of the Chadwick Trust. No attempt having been made within recent times to review the vaccination question, since the issue of the final Report of the Royal Commission on Vaccination eighteen years ago, the author's aim has been to supply this deficiency, in which he has endeavoured to take up an entirely independent standpoint, leaving himself quite free "to use any argument that appeared to him, after mature consideration, to be sound, irrespective of whether it tells in favour of or against vaccination." Three chapters are devoted to the "Leicester Experiment," giving in detail the history of the movement against vaccination, its results, and the experience gained from the unvaccinated area. The author claims that if the Royal Commissioners had had before them the present results of the "Leicester Experiment," it is highly probable that the verdict of the Commission would have been against compulsion in any form. Moreover, he affirms that it is "reasonable to believe that with the perfecting and more general adoption of modern methods of control and with improved sanitation (using the term in its widest sense) small-pox will be as completely banished from this country as has been the case with plague, cholera, or typhus fever." The tendency of vaccination to spread small-pox through its effects in modifying, and at the same time masking the disease, is fully dealt with, and illustrative cases are added in an appendix.

APPENDICITIS: A PLEA FOR IMMEDIATE OPERATION. By EDMUND OWEN, F.R.C.S., D.Sc.(Hon.). Pp. xii + 214. Bristol: John Wright and Sons, Ltd., 1914.

This work, which the author describes as an "Essay," is an amplification of his plea in favour of immediate operation in appendicitis, urged by him in a paper read before the Medical Society of London last year. The subject attracted general notice and led to much discussion in the medical press. The object of the book is to emphasize further the teaching thus inculcated, especially, as stated in the preface, since professional opinion is even yet not solid on the advisability of early operation in appendicitis, "so that some more hammering at the subject may be useful." But while the main object of the book is centred on the author's plea, the work, at the same time, forms a monograph on the subject, constituting a *résumé* of our knowledge of appendicitis, in which the chief share of attention is devoted to its practical aspect.

THE FÆCES OF CHILDREN AND ADULTS: THEIR EXAMINATION AND DIAGNOSTIC SIGNIFICANCE, WITH INDICATIONS FOR TREATMENT. By P. J. CAMMIDGE, M.D.Lond. With 13 full-page plates, seven of which are coloured, and 96 illustrations in the text. Pp. viii + 516. Bristol: John Wright and Sons, Ltd., 1914.

This book is based, partly on Hecht's "Die Fæces des Säuglings und des Kindes," partly on Schmidt and Strasburger's "Fäzes des Menschen," but mostly upon the author's own observation and experience during the past fifteen years, during which he has examined several thousand specimens of fæces. To coin a word, "Fæcology" is becoming an important branch of medicine, for diagnostic and therapeutic purposes, as is proved by the increasing area of its literature. The author deals first with the macroscopical, microscopical, and bacteriological examination of fæces, and next, in a fully illustrated chapter, with the animal parasites contained in them. Descriptive chapters follow on the chemical analysis of fæces, in the fresh and dried state, and of the chemical examination of fæcal calculi and concretions. Among drug calculi those formed of salol, magnesia, calcium carbonate, benzoic acid, are mentioned. The two concluding chapters are devoted to a discussion of the clinical inferences to be drawn from the results in the analyses described, and the indications for treatment which they suggest, and the author shows how, from the fæcal point of view, the diet and administration of drugs can be controlled. In an appendix are included remarks upon the artificial feeding of infants, and diet schemes for various diseases, such as acute and chronic gastritis, hyperchlorhydria, gastric and duodenal ulcer, dilatation of the stomach, mucous colitis, atonic and spastic constipation, oxaluria, pancreatic insufficiency, catarrhal enteritis and others.

I

PROCEEDINGS

OF THE

ROYAL SOCIETY OF MEDICINE

VOLUME THE SEVENTH

COMPRISING THE REPORT OF THE PROCEEDINGS FOR THE
SESSION 1913-14

Section 2.

SECTION OF ANÆSTHETICS



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Section of Anæsthetics.

November 7, 1913.

Dr. J. BLUMFELD, President of the Section, in the Chair.

Case of Tachycardia.

By A. L. FLEMMING, M.B.

THE following case of tachycardia during anæsthesia occurred in my practice at the Bristol Royal Infirmary on April 18, 1913. The patient, G. T., was an apparently healthy girl, aged 12, the subject of an inguinal hernia for which radical cure was performed. She was nervous, and her pulse-rate immediately before induction was approximately 120—the average rate as previously recorded in the ward was 84. Anæsthesia was induced by means of open ether, not preceded by atropine or other alkaloid. Induction was quiet and uneventful and the operation had proceeded for five minutes before it was noticed that the pulse was becoming rapid in rate. During the next five minutes the pulse-rate reached 264, and at that level it remained with slight variation throughout the operation, which lasted nearly half an hour. No effect was produced on the pulse-rate either by the varying nature of the surgical procedure or by varying depths of anæsthesia. The anæsthetic was changed to chloroform, but as the tachycardia persisted ether was resumed. The depth of anæsthesia was increased until the corneal reflex was quite abolished and the pupil reflex was very sluggish, but these measures had no effect on the abnormal pulse behaviour. Respiration remained even, automatic, and did not exceed 30 per minute. There was no cyanosis.

After the operation the pulse-rate remained at 264 until ten minutes later, when retching was followed by a drop to 192, but this reduced rate persisted only for one minute, after which the high level of 264 was again reached. The patient at this juncture overheard me proposing

to turn her on to her side, and acting on the suggestion she rolled herself on to her left side and immediately the pulse-rate dropped to 84.

Dr. James Swain and Mr. Walters corroborated the high count, and Dr. Edgeworth examined the patient subsequently but found nothing to account for the phenomenon.

DISCUSSION.

The PRESIDENT (Dr. Blumfeld) drew attention to the occurrence of tachycardia as a precursor of ventricular fibrillation in light chloroform anæsthesia as described by Goodman Levy.¹ As regards the alteration of position—he had often found benefit by turning a patient on to the right side, but had never been led to have one placed upon the left, except in cases of empyema of that side.

Dr. BEZLY THORNE referred to the case of a patient, aged 65, who six days previously had been operated on for strangulated femoral hernia. As she was the subject of aortic regurgitation and aneurysm of the ascending aorta, local anæsthesia by means of novocain and adrenalin, preceded by a small hypodermic dose of morphia and atropine, was resorted to. As, however, the state of the gut involved a longer procedure than had been anticipated, a small quantity of chloroform was introduced towards the end of the operation, which lasted about an hour. The point which he wished to bring before the Section was that for about four days after the operation the pulse, whenever observed by himself or the nurses, was characterized by brief periods of tachycardia followed by almost equal intervals of the patient's normal rate of from 80 to 84 beats per minute, each lasting from four to six seconds. The accelerated or premature beats numbered from about ten to twelve for each series. In either case the pulse was so regular in quality and frequency that fibrillation was excluded; and as the lower rate was the normal for the patient, heart-block was not in question. As soon as the patient's condition seemed to justify his doing so he had gone to take some graphic records, but unfortunately the pulse had, by that time, resumed its usual rate with no more than one or two isolated premature beats per minute as before the operation.

Mr. CARTER BRAINE stated that the fact of Dr. Flemming having had experience of two cases in which the tachycardia ceased when the patient had been turned on the left side was most interesting. He suggested in reply to Dr. Flemming's question as to what should be done in the event of this child requiring another operation, that the induction of anæsthesia be conducted with the patient in the lateral position, and the patient kept in that position if possible throughout the operation and also during recovery.

¹ *Brit. Med. Journ.*, 1912, ii, p. 627.

Some Impressions of Anoci-association.

By J. H. CHALDECOTT.

WHEN we take into consideration the number of improvements and innovations that have been introduced in the administration of both general and local anæsthetics during the past few years, it is strange that, until the publication in the *Lancet*¹ of Dr. Crile's paper last July, no one in this country has thought of employing them in combination. You will recollect that the paper I refer to was on the subject of shock. The author maintained that during a surgical operation a patient was subjected to a series of nervous shocks which caused damage to the brain cells to an extent in proportion to the severity of the operation. He contended that general anæsthetics such as chloroform or ether do not arrest these harmful impressions passing to the brain, and that by their toxic effects they lower the patient's resistance, that if local anæsthesia alone is used, harmful traumatic shocks can be prevented, but that in that case almost equal danger is done to the central nervous system by the effects of apprehension and fear upon the patient's brain. He accordingly devised and employed a combination of anæsthetic methods under the name of "anoci-association," and he claimed that by this means the post-operative condition of patients was very greatly improved and that his general surgical results were very much better.

It is obvious that none of us can have yet had sufficient experience of the method to have formed any fixed opinion as to its merits, but it must be admitted that it is an innovation of such importance and interest to this Society that even at this early stage no harm can be done by discussing it.

My own experience of anoci-association is limited to between fifty and sixty cases, and I consequently open this discussion with considerable diffidence, and with no wish to pose as an authority on the subject. The method consists, as you will remember, of three parts:—

(1) Injections of morphia or of morphia, atropine and scopolamine, previous to the operation.

(2) The employment of nitrous oxide, gas and oxygen as a general anæsthetic.

¹ *Lancet*, 1913, ii, p. 7.

(3) The blocking of all nerve channels proceeding from the site of operation by infiltration of the tissues with a quarter per cent. solution of novocain, and later on with a half per cent. solution of urea and quinine.

(1) The first step in the method is familiar to all of us, and is of course not new. From the psychical point of view these preliminary injections are doubtless an important, though not an essential, part of anoci-association, inasmuch as they minimize fear, and the patient approaches the operation in a drowsy condition and in a more or less contented frame of mind. This fact is indisputable, but many of us, I think, have still an open mind as to whether the use of these drugs as an adjunct to general anæsthesia is always an unmixed blessing. That they are not essential is certain, as some of our most strikingly successful cases have not had them, and there is one objection to the use of morphia—viz., that in some subjects it undoubtedly causes nausea and vomiting. It is, however, impossible to know how far the injections are necessary until there has been time and opportunity to compare large numbers of anoci-association cases with and without them.

(2) *The General Anæsthetic.*—In anoci-association it is clear that the general anæsthetic is only employed to keep the patient unconscious and oblivious of his surroundings and not to provide the surgical anæsthesia, and we may assume that the nitrous oxide and oxygen mixture was selected for the purpose, not only for its safety, for its non-toxicity, for the rapid return to consciousness and the absence of unpleasant after-effects, but also because it does not produce a sufficiently deep anæsthesia to cloak imperfections in the infiltration. In order to obtain an ideal result in a state of anoci-association the nerves should be so completely blocked by the local anæsthetics that—but for the objection of psychical shock—the operation could be performed without the administration of a general anæsthetic at all. Under a gas and oxygen anæsthesia, imperfect infiltration is easily detected and should be remedied by the surgeon and not by the anæsthetist. When the infiltration fails, doubtless the quickest way out of the difficulty is for the operator to call upon the anæsthetist to switch off his gas and oxygen and administer ether or chloroform. That, I say, is the quickest way, but it is not anoci-association and cannot be expected to produce the results which Crile claims for his method. Even if, at a later stage of the operation, more extensive infiltration is resorted to, it is impossible to gauge its efficiency when the patient is inhaling an anæsthetic sufficiently strong to mask the reflex manifestations of shocks

transmitted by imperfectly blocked nerves. One can quite well foresee that a combined anæsthesia of novocain and chloroform or ether may have much to recommend it, especially with a view to minimizing the amount of the general anæsthetic given towards the end of an abdominal operation when muscular relaxation is necessary for the wound to be sewn up. That, however, is an entirely different thing from anoci-association, which aims at the prevention of nervous shocks and not merely at the prevention of their manifestation.

For administration of the gas and oxygen I have always used Hewitt's apparatus, with a flexible tube between the dial and facepiece, long enough to allow the rest of the apparatus to stand clear of the table.

My chief difficulties in administration have been in the early stages. It is clearly against the principles of anoci-association to allow the patient to be brought into the theatre before induction, and it is by no means easy to keep up a level type of anæsthesia while he is being moved from the trolley to the table and placed in the necessary position for the operation. It is difficult to use the gas and oxygen apparatus while moving it from one room to another, so I usually take the patient into the theatre under gas and air, and have the gas and oxygen apparatus ready fixed by the side of the table, so that I can begin to use it directly the patient has been lifted off the trolley. If the patients have to be placed in the Trendelenburg position, or lifted up to have a sandbag or air-cushion under the back, it is sometimes very difficult to keep them from getting rigid, but after a minute or so they generally settle down, and directly a steady rhythm of breathing has been established the infiltration can be commenced.

Allowing that care has been taken that there shall be no mechanical obstruction to freedom of respiration, there is rarely much difficulty in long administrations of the combined gases; the patient will breathe satisfactorily and retain a good colour until some imperfectly infiltrated spot is touched or he is subjected to a manipulation which is too rough for the local anæsthesia. This is always shown by some change in the respiration; there is either temporary cessation of breathing or the respiration becomes strained and the patient cyanosed even when inhaling a large percentage of oxygen. Additional infiltration or the cessation of rough handling, or in some instances withdrawal of gauze packs from contact with parietal peritoneum, will generally put matters right. The breathing will resume its regularity and the cyanosis will disappear. This strained breathing and cyanosis may be

present without any rigidity of the abdominal wall, as the latter may be perfectly infiltrated while the deeper parts, which are being handled, are not.

I have always worked throughout with an expiratory valve, and have never let the patients re-breathe, so that I cannot speak with any experience of that variation of the method. The objection to the non-employment of re-breathing is the large quantity of gas used during a long operation, and in hospital work the question of expense necessarily crops up. I find, however, that I make the gas go much further now, since I have had more experience in its administration, and I can usually get through an operation lasting an hour with 100 to 125 gallons of nitrous oxide.

I have only had to abandon the gas and oxygen administration in two instances. One occasion was that of a man, during a gastro-enterostomy, upon whom neither novocain, gas nor ether appeared to have much anæsthetic effect, and it was by no means easy to maintain surgical anæsthesia even with chloroform. The second case was for an abdomino-perineal excision of rectum. In this instance the deep infiltration was insufficient and the operation was concluded under ether.

At the conclusion of the operation it is advisable to continue the administration of the gas and oxygen until the patient is removed from the theatre, as, even after long operations, the return to consciousness from this anæsthetic is very quick. The longest continuous gas and oxygen anæsthesia which we have had at St. Mary's Hospital lasted two hours and twenty minutes, when it was administered by one of the house surgeons.

My colleagues and myself have now employed this method in a fairly large variety of cases. I do not propose to trouble you, at the moment, with detailed notes, as I think they would be better published at a later period when many more cases have been tried; but roughly speaking I may say that our results have been most encouraging, especially in the severe cases. In nearly every case in which gas and oxygen has been administered throughout, unpleasant after-effects have been insignificant, and this is, of course, what one would expect, as the fact of gas and oxygen proving sufficient is strong evidence that the infiltration was satisfactory. In some of our cases there have been no unpleasant after-effects at all. The patients have recovered consciousness within a few minutes of the gas and oxygen being discontinued, there has been no vomiting or delirium, and from the

demeanour and general condition of the patients it has been difficult to realize that they had just undergone a severe operation. In a smaller proportion of cases the after-effects have not been quite so good, and there has been some vomiting or retching, but of a much slighter and less distressing character than is seen after long administrations of chloroform or ether. In one case, which occurred in my private practice, the patient, a man, vomited on and off for twenty-four hours after an appendicectomy. This patient, however, had taken chloroform and ether on several occasions and had always been sick for several days afterwards, and he volunteered the information that he suffered far less on this occasion than on the previous ones.

The operations for which I have been able to give uninterrupted administrations of gas and oxygen include gall-bladder operations, gastro-enterostomies, nephrectomy, colostomy, appendicectomy (both in the acute and chronic stages), hysterectomy, Wertheim's operation, several other pelvic operations, and partial thyroidectomy for exophthalmic goitre. Gall-bladder cases seem to be easily infiltrated, have taken the gas and oxygen well, and have given us exceedingly good results. Several of the gastro-enterostomies have also gone quite smoothly, but in two or three instances there has been considerable venous congestion of the parts clamped, and the operator has found this inconvenient. All the pelvic cases gave very gratifying results, and there has been much less after-pain than usual in these cases; whether this improvement is due to the urea and quinine or to the greater surgical gentleness which the method necessitates, I cannot say.

In Crile's hands the method appears to be of special value for operations upon the thyroid gland in cases of Graves's disease, and my limited experience in that direction leads me to think very highly of it. I recently had an opportunity of comparing the immediate after-effects of two similar operations performed for advanced exophthalmic goitre by different methods. No. 1 was operated on under a local infiltration of novocain only. No. 2 was operated on by Crile's method with novocain, urea and quinine locally and gas and oxygen as the general anæsthetic. Before operation the condition of patient No. 2 was very much more serious than that of No. 1, but her post-operative condition was better, inasmuch as she had no sickness or nervous shock and, probably owing to the urea and quinine, had no pain, whereas No. 1 who had had no general anæsthetic was sick several times, had a great deal of neuralgic pain in the face and neck, and an appreciable amount of nervous shock, shown by increased tremors and intense restlessness.

In an ordinary straightforward case of anoci-association the time spent is very little longer than that occupied by an operation performed under chloroform or other anæsthesia; but, if there is any difficulty in the infiltration, matters may be considerably delayed. This, however, does not seem to affect the results by increasing the after-effects. Deliberation and gentleness appear to produce much less after-effect than rapid manipulations, which are generally attended by a certain amount of roughness, and it is incomparably easier to give the gas and oxygen when the surgeon makes no attempt to work quickly. We have never been able to detect the slightest toxic effect from the novocaine injections.

In hospital cases it is not unlikely that more consistently good results would be obtained if it were possible to give more study to the psychical aspect of the question and to separate anoci-association patients from those who are operated on by the old method, but up to the present we have not had an opportunity of doing anything practical in this direction.

So far as one can venture to prophesy on such limited experience I think that the method will find its most useful application in very bad cases in which it is important to avoid shock, or not to add to shock if it already exists. In such cases it is conceivable that the toxic effect of chloroform or ether may, not infrequently, just turn the scale against the patient. In slight operations the unpleasant after-effects are usually so trivial that Crile's method naturally cannot show a marked difference. But from what I have seen I am distinctly of opinion that it will repay British surgeons to give the method a thorough trial, remembering always that the smooth working of each case must depend more upon them than upon the anæsthetist, as the ideal result can only be obtained by a practical knowledge of the technique of local infiltration.

Some Points in the Technique of Anoci-association.

By C. W. G. BRYAN, F.R.C.S.

IN a few words I propose to discuss some of the points of technique which we have noticed since beginning to carry out anoci-association. I approach the subject with diffidence in view of the small experience of the method which I possess at present, and I hope rather to provoke suggestions than to bring forward any very well established facts. The injection of local analgesics is made use of to overcome three main evils of abdominal surgery—shock, and the cyanosis and rigidity which exist when the tissues are manipulated under gas and oxygen anæsthesia alone. So far as our experience goes we are in entire agreement with Crile that success largely depends on the local anæsthetic, and shock, cyanosis and rigidity must be prevented by the efforts of the surgeon and not by depth of general anæsthesia. As regards shock, deep general anæsthesia merely masks the trauma which is being inflicted on the patient's nervous system, and the great value of the anoci-association method, from the patient's point of view (as of spinal anæsthesia), consists in the fact that harmful manipulations are at once made manifest to the surgeon, by the onset of cyanosis and rigidity in the case of the anoci-association method. On their own account, of course, cyanosis and rigidity are to be avoided; cyanosis of gut makes intestinal anastomosis difficult, and it involves the risk of hæmorrhage, delayed healing, and other post-operative complications; while rigidity would make many operations impossible.

Dealing with the technique of infiltration of the abdominal wall in opening the peritoneal cavity, Crile in his paper published in the *Lancet* of July 5,¹ gives quite minute details, and I need only touch lightly on this subject. The best anæsthesia is obtained when the solution is injected under pressure, and therefore either a large needle should be used and the injections made rapidly into the various layers, or else after each injection pressure by the hand should be applied to the area infiltrated. This abdominal wall infiltration is sufficient to ensure relaxation for operations in which there is not much dragging on viscera.

¹ *Lancet*, 1913, ii, p. 7.

and in which the parietal peritoneum is not extensively manipulated. Where, however, the more complicated surgical procedures have to be carried out, infiltration by novocain of the abdominal wall alone will probably be insufficient. Of the cases in which we have so far made observation of the method, the most successful and striking have been those of operation in the region of the gall-bladder and duodenum, where on several occasions extensive procedures, such as cholecystectomy, cholecystotomy for gall-stones, and suture of perforated duodenal ulcer, have been carried out on aged and toxæmic patients with no apparent shock, and an entire absence of after-effects. In looking for the reason for the special success met with in this region one comes across the observation that in one case of exploration for suspected perforated duodenal ulcer, on opening the abdomen—after a thorough infiltration of the extraperitoneal tissue in the line of the incision—the falciform ligament, the cellular tissue in relation to the gall-bladder and its mesentery, the lesser omentum, and the retroperitoneal tissue near the duodenum were already œdematous from the rapid spread of the novocain from the region of the abdominal wall wound. Now in operations on the left side of the upper abdomen, nearly all cases of gastro-enterostomy, only a minority of the cases have been completely anæsthetized, and the surgeon, though not usually troubled by rigidity, was in several cases handicapped by cyanosis of the viscera and of the patient generally—this being due probably to the necessary dragging on the stomach and the duodeno-jejunal junction. This, then, is one point in the technique—a point on which at present I am unable to give much account of actual experience—the necessity in many cases of shutting off impulses from the viscera which are to be manipulated, if there is to be any dragging on the mesentery. To obtain anæsthesia in these cases methods of nerve-blocking can be carried out by injecting the local analgesic into the mesentery, a procedure which Crile mentions in his paper, but to which he does not devote much space. At the beginning of the operation it seems advisable to inject novocain in free amount into the lesser omentum, the mesentery proper, the retroperitoneal tissue in relation to the cæcum, the meso-appendix, or the broad ligaments, according to the viscus to be operated on, and one can confidently expect that the solution will permeate quickly and block the nerve impulses of a large area. In fact, it may be that an injection placed so that it will travel to the region of the celiac axis vessels would block sensations from most of the abdominal viscera. I hope by experiments to be able to decide on the sites for

these injections, which are best suited to the various viscera, and I believe that a coloured solution of the local anæsthetic, used in the living patient, might enable us in time to observe the extent to which the solution will travel, and to lay down definite rules for nerve-blocking the various regions of the abdomen. Mesenteric injections such as I have mentioned should be made as soon as the peritoneal cavity is opened, and by the time much manipulation is necessary anæsthesia should be complete.

The onset of rigidity is usually the surgeon's first indication that anoci-association is not being properly carried out, but we have observed that relaxation can in many cases be again produced if novocain injection of the abdominal wall, &c., be repeated, and the further manipulations are made more gently. Rough surfaces and bodies, such as gauze, swabs and packs, have been seen again and again to cause cyanosis and rigidity if they are placed in extensive contact with parietal peritoneum, if they are packed among the abdominal viscera in large numbers, and if they are suddenly dragged out from among the viscera at the end of the operation. The use of careful packing is, of course, an essential of modern abdominal surgery, and is one of the important advances of recent years, but it seems to clash with anoci-association methods, and to give rise to difficulties at whose solution we have not yet arrived. To a certain extent, perhaps, rubber packs might be employed, and judging by manipulations with the rubber-gloved hand, I believe they would be borne better than gauze by the parietal peritoneum. Rigidity induced by packs placed among the viscera seems to go off after a time, if the position of the packs is left unaltered.

I need not dwell on such points as the advisability of large incisions, where anoci-association is used, as involving less dragging and retraction, and making manipulations easier and less numerous; the necessity for gentleness of manipulation throughout the operation is obvious.

I regret the rather theoretical nature of my remarks, but I hope that discussion will suggest a solution of some of the difficulties to which we have referred.

DISCUSSION.

Mrs. DICKINSON BERRY suggested that much of the advantage of Crile's method might be obtained by the use of other anæsthetics than gas and oxygen combined with local anæsthesia, and instanced cases in which a very small amount of ether had been used with satisfactory results. In one case, that of a man who was undergoing an extensive operation on the neck

under novocain, and who was in a condition of considerable distress and nervous tension, though probably not suffering much actual pain, she commenced giving oxygen accompanied by a few drops of ether about midway through the operation. The pulse, which had been about 160 both before and during the operation, dropped to 100 and remained about that rate till the operation was concluded. The breathing became deep and regular, the patient lost all signs of distress, did not respond to remarks addressed to him, and was apparently unconscious, though he could be roused easily if required. The administration was carried on during twenty-five minutes; only $\frac{1}{2}$ dr. of ether was used. Mrs. Berry also alluded to the point mentioned by Mr. Chaldecott of the inconvenience of giving gas and oxygen for induction elsewhere than in the operating theatre. Some of the surgeons for whom she worked preferred to have the patient brought straight into the theatre, and the anæsthetic commenced there. In her experience very few patients, if any, were at all affected by this. It was the operation, or possibly the anæsthetic, which loomed large in the patient's vision, and whether the proceedings were commenced in the theatre or elsewhere she thought made really very little difference.

Mr. CARTER BRAINE said that he had had the privilege of witnessing Mr. Chaldecott administer to "anoci" cases at St. Mary's Hospital, and had been much impressed with the excellence of the anæsthesia obtained—so much in fact, that he borrowed the apparatus Mr. Chaldecott was using, and employed the method on three cases at Charing Cross Hospital the following day with complete success. There was no difficulty in maintaining a successful anæsthesia provided the surgeon was not too sparing with the novocain; success was due to efficient nerve-blocking, and consciousness was abolished by nitrous oxide and oxygen. These cases had not been selected ones for this method: they were all severe abdominal operations with the patient in the Trendelenburg position; two were hysterectomies, and the other salpingo-oöphorectomy and appendicectomy. The largest administration was one hour and forty minutes. All had been injected with morphine $\frac{1}{6}$ gr. and atropine $\frac{1}{100}$ gr. beforehand. Recovery was rapid with absence of shock, but there was slight after-sickness in each case. Duskiess of the countenance occurred when there was much packing with gauze, and when there was traction upon abdominal contents, but this ceased when the determining cause was over. Rebreathing was not employed. The great disadvantage of the method was the constant turning on of the gas bottles, and keeping the bags properly supplied; this was a little worrying and took away some of the attention which should be devoted to the patient. This could be obviated by employing a gasometer and having a pipe delivering the gases to the operating theatre. The expense of this method had also to be considered in our hospitals. With the above satisfactory experience it was decided to try what could be done by substituting chloroform or ether for the nitrous oxide and oxygen. Anæsthesia was obtained with chloroform, employing the Harcourt

inhaler, and then novocain injected, and the operation commenced immediately. It was then found that the strength of the chloroform vapour could be reduced to as little as 0·6 per cent., 0·4 per cent. for quite long periods, and only when there was much dragging of viscera, gauze packing, &c., was it ever necessary to increase to 1 per cent. strength. This method appeared to be almost as good as nitrous oxide and oxygen, both during the operation and afterwards, in fact, the operator expressed the opinion: "Quite as good as anoci." It did away with a vast amount of apparatus, and the expense was in comparison trifling. Nitrous oxide and oxygen could be reserved for those severe cases in which the administration of chloroform or ether even in small amount was absolutely contra-indicated.

Mr. VESSELOVSKY acknowledged the excellent results obtained in a large proportion of the cases where gas and oxygen were used in anoci-association, but agreed with Mr. Carter Braine that the substitution of open ether for gas and oxygen would be often advantageous. In two abdominal cases, in which the patients were in a most critical condition when placed on the table, he had obtained excellent results from the use of ether in this manner. Although respiration with gas and oxygen was in most cases lighter and easier than with other anæsthetics, the experience he had gained from his own cases and from watching other administrators had shown that a considerable proportion suffered from cyanosis, either slight or marked, and this often notwithstanding the absence of any labour in the respiration. This cyanosis might be sufficient to turn the scale detrimentally in those cases where shock was extremely marked and the patient at the last ebb, whereas the stimulating effect of ether would not be without benefit. The amount of ether given would be much less than when used as a general anæsthetic without the injections. The type of the patient had to be considered in the choice of the anæsthetic, especially in abdominal cases involving much traction on the peritoneum. He had found post-anæsthetic vomiting in a number of cases where gas and oxygen had been administered, but the degree of vomiting was less than with ether.

An Apparatus for the Administration of Ether in Nose and Throat Operations.

By RAYMOND E. APPERLY.

IN nose and throat cases requiring a general anæsthetic, when the operation is of some duration, I have been accustomed to use chloroform administered by Junker's apparatus for maintaining anæsthesia, and although the results obtained were fairly satisfactory, there have been a certain number of cases which caused anxiety during the operation. Dr. A. G. Levy¹ has shown the danger of the combined use of chloroform and adrenalin, in causing ventricular fibrillation, and I believe the anxiety one has at times experienced in these cases is entirely due to the combined action of these drugs. He lays particular stress on the fact that a light chloroform anæsthesia, such as is maintained during operations on the nose and nasopharynx, is more dangerous in combination with the use of adrenalin than a deep anæsthesia. This has led me, on the suggestion of Mr. Somerville Hastings, to adopt ether as the routine anæsthetic in intranasal operations, for apart from its greater safety as an anæsthetic in comparison with chloroform there is no increased danger in its use when adrenalin has been employed. It was anticipated that hæmorrhage would be increased, which is particularly undesirable in nose and throat cases, but the reverse has been my experience, due, I think, to the ease with which a steady and even anæsthesia can be maintained.

Apparatus.—The apparatus employed has been a modification of the Junker chloroform inhaler to suit the requirements of ether. It consists of a glass jar with a heavy base, and fitted with a rubber cork pierced by three holes. Across the jar at about 1 and 2 in. from the bottom are fitted two circular pieces of metal gauze; through the centre of these runs a glass tube to within $\frac{1}{4}$ in. of the bottom of the jar. This tube passes through the central hole in the rubber cork, and is connected outside by thick rubber tubing with a Fletcher's foot-pump. Through the second hole in the cork a short glass tube just enters the jar and is connected by tubing with a flexible metal delivery tube. The third opening in the cork is used for refilling the jar. The delivery

¹ *Brit. Med. Journ.*, 1912, ii, pp. 627-30.

tube is fitted with a slightly concave plate of thin metal which can be adjusted in any position, and is designed to cover the mouth loosely and prevent the ether vapour being expired directly into the face of the operator. The jar is half filled with ether, so that both pieces of gauze are submerged. Air is then pumped through it by means of the bellows. The air-bubbles are broken up in their passage through the fine gauze and a strong ether vapour is given off. If the operation lasts more than ten or fifteen minutes the jar should stand in a basin of tepid water.

The cases in which I have used the apparatus, with one or two exceptions, have been under the care of Mr. Somerville Hastings, and our procedure has been as follows: One hour before operation a subcutaneous injection of morphine tartrate $\frac{1}{4}$ or $\frac{1}{8}$ gr. and atropine sulphate



Apparatus for the administration of ether in nose and throat operations.

$\frac{1}{100}$ gr. is given. About half an hour before operation each nasal cavity is packed with a single strip of 1-in. ribbon gauze soaked in a solution made up of four parts of 1 in 1,000 adrenalin solution, and one part of a watery solution of 20 per cent. cocaine hydrochloride. Anæsthesia is induced with nitrous oxide and ether given with a Hewitt's wide-bore ether inhaler, the gauze packing being left in the nose until the commencement of the operation unless any respiratory difficulty arises, when being in two single strips it can easily be withdrawn by the anæsthetist. When the patient is fully anæsthetized he is raised to the semi-recumbent posture, a Doyen's gag inserted, and mouth-breathing established. The ether delivery tube is placed in the mouth and the

metal plate adjusted to cover it, but no further anæsthetic is given until the presence of a brisk corneal reflex makes it clear that a cough reflex is also present. The foot-pump is now brought into use, and a light anæsthesia maintained by its means. For throat operations the procedure is essentially similar, except that the metal plate is removed from the delivery tube. Where considerable hæmorrhage is anticipated, and a tracheotomy has been done and the pharynx plugged, the anæsthetic can equally well be administered through the tracheotomy tube. In operations for ethmoidal disease and antral suppuration where hæmorrhage is anticipated and the nasopharynx is not plugged it is wise to maintain a somewhat lighter anæsthesia than that for a simple submucous resection of the septum. Where posterior ends or adenoids have to be removed at the termination of a septal operation the anæsthetic should be discontinued some three or four minutes beforehand, so that the patient may be in a condition to deal with the bleeding which is certain to follow. After operation the patient is placed on his side in bed with the head resting on a low pillow.

Up to the present I have used this apparatus in seventy-nine consecutive cases of nose and throat operations where a general anæsthetic of some duration was required; fifty-seven were in hospital and twenty-two in private practice. Of the above one was for excision of malignant growth of the pharynx, one for exploration of malignant growth of the larynx, four were for œsophagoscopy, three were for diseases of the antrum, eight were for ethmoidal disease, five were for middle turbinectomy with removal of tonsils and adenoids, fifty-seven were for submucous resection of the septum, in addition to which in many cases either the middle turbinal, tonsils, adenoids, or posterior ends were removed. The ages of the patients varied between 14 and 69. All types of patients were represented; six were asthmatics.

The advantages of the above method are:—

- (1) Its greater safety in comparison with chloroform, especially when adrenalin has been applied.
- (2) The ease with which a light and even anæsthesia can be obtained.
- (3) The good colour and strong pulse maintained throughout the operation, and consequent freedom from anxiety.
- (4) Less post-operative vomiting.
- (5) Less after-shock.
- (6) The use of the foot-bellows leaves the anæsthetist's hands free to adjust the head, or in any other way to assist the surgeon.

Section of Anæsthetics.

December 5, 1913.

Dr. J. BLUMFELD, President of the Section, in the Chair.

A Review of Inquests concerning Deaths during Anæsthesia, 1910-1913.

By A. L. FLEMMING, M.B.

WHEN starting to arrange these notes my intention was to quote the opinions of various authors upon the many questions involved—but, realizing that my audience to-night would consist of authorities greater than any to be found elsewhere I decided to lay before you, in as simple a manner as possible, such facts as could be deduced from the material at my disposal.

You will, I hope, excuse a deplorable deficiency in scientific accuracy when you remember that our food for discussion to-night (if I may employ an epigram) consists only of such portion of the pabulum as has managed to squeeze through the newspaper filter. The source of my information is the lay press accounts of coroners' inquests, and is by no means sufficiently complete to furnish statistical details of any value. It seems a great pity that we cannot devise some method by means of which we might obtain full and accurate accounts of all instances where an anæsthetic either kills, helps to kill, or threatens to kill. One naturally wonders whether this Section could not do something in the direction of inducing anæsthetists to report their difficult cases so that we might have the advantage of their experiences. As an illustration of the incompleteness of many of the reports, we find that in only 542 of the 700 is mention made of the nature of the anæsthetic employed.

The first point which attracts our attention is the number of fatalities occurring, with melancholy regularity in different parts of the country (the reports refer almost entirely to England, a few only coming from Wales). The Registrar-General's returns show 155 in 1905, 235

in 1908, and 276 in 1911. Although some of this increase may fairly be regarded as inevitable, from our anæsthetic standpoint, in consideration of the desperate nature of some of the present-day surgical procedures, nevertheless a perusal of the evidence as reported in connexion with these 700 cases can leave no doubt in one's mind as to the avoidability of a large majority of the fatalities. In many cases the fault seems to have lain in an indiscreet selection of the anæsthetic to be used; it is difficult to understand why chloroform should have been used in many of these instances. Most of the administrators were men of very limited experience, and the explanation which seems most obvious is to suppose that they had probably seen chloroform used with perfect ease and safety by men of experience in their hospital clinics, and that they naturally expected to be able to use it themselves with equal success. Such evidence of a false sense of security seems to point to some deficiency in the practical part of our teaching system. Of course surgeons bring their influence to bear in the choice of anæsthetics, but fortunately they are now realizing that under ether anæsthesia, if cyanosis be avoided, abdominal walls can be relaxed, and excessive hæmorrhage does not necessarily occur.

I must crave your indulgence if I have given undue prominence to the old question of ether versus chloroform, but it is difficult to conceive how this topic could have been avoided in face of the analysis as set out in Table I. Moreover, one cannot but feel that a large number of these accidents would not have occurred if ether had been used during induction, or at any rate during the struggling stage. The reports show, and Tables I, VI, and VII tend to demonstrate, the importance of asphyxia as a factor in death under chloroform; for if the number of deaths occurring during the struggling stage be added to the number of cases in which an asphyxial element either pre-existed or was introduced by the operation, the total number of chloroform or "mixture" fatalities is accounted for. It is not surprising, then, to find Table VIIA containing so large a number as 56 of tonsil and adenoid cases, but there is especial interest in the tendency shown by these subjects to die rather suddenly and quite unexpectedly shortly after the operation, after an interval varying from one to fifteen minutes. Whether the important factor is the occurrence of ventricular fibrillation due to lightness of anæsthesia, as suggested by Dr. Goodman Levy, or whether the cause is a combination of such phenomena as the faintness of vomiting and a degree of asphyxia caused by the nature of the operation, I must ask you to decide. For my part I would describe the

condition as one of incomplete anæsthesia, and not one of light anæsthesia—a distinction which, I think, is not always duly remembered. It seems remarkable that dental extraction should still be performed under chloroform, or that nitrous oxide anæsthesia should be employed in such cases as angina Ludovici, in spite of all the warnings which we have had against these methods.

My impression as to what is the best anæsthetic to employ in cases such as appear under Table VIIA is that ether is suitable for practically all of them; and that where this drug cannot be employed throughout the operation, it may with advantage be used for inducing anæsthesia.

If we now turn to Tables IV and VI, we find that the anæsthetic seems to have been more or less responsible for death in no fewer than 521 instances. The reports were difficult to analyse, and possibly more of the blame should be attributed to surgery, but this does not apply at any rate to the 223 cases where death occurred before the operation had been commenced. Among the 100 instances where surgery was distinctly a contributing factor there were many operations of great severity and of long duration. These accidents seem to be unavoidable, in so much as various surgeons must naturally differ in their capacity for combining rapidity with gentleness. Although there are reports of 83 deaths taking place after operation, in only seven of these (six boys and one girl) was acidosis alleged to be the cause.

Bearing in mind the work of Dr. Goodman Levy, recently published in *Heart*, under the title "The Exciting Causes of Ventricular Fibrillation in Animals under Chloroform Anæsthesia,"¹ it may be of interest to mention that in seventeen of these reports there is a definite history of intermission in anæsthesia and reapplication of the anæsthetic, a practice which one learned to regard as dangerous in the old days of deep chloroform anæsthesia, when one too frequently met with instances of sudden collapse, calling for immediate cessation of the administration and for artificial respiration—a measure practically never required under modern methods of anæsthetizing.

In six cases general and local anæsthetics were used in combination. As chloroform was used in at least five of these six combined anæsthesias we may herein find a warning which will make us cautious in our choice of drug in anoci-association practice. In three cases adrenalin was injected under the mucous membrane of the septum during chloroform anæsthesia. Surely enough warning has already been published concerning this use of adrenalin.

¹ *Heart*, 1912-13, iv, pp. 319-78.

ANALYSIS

OF 700 DEATHS CONNECTED WITH ANÆSTHESIA, REPORTED IN THE LAY PRESS, YEARS 1910 (INCOMPLETE), 1911, 1912, 1913 (INCOMPLETE).

TABLE I.

Nature of Anæsthetic.

Chloroform	...	...	...	378
Ether	...	...	...	28
C.E., A.C.E. and A.C. mixtures	...	...	...	100
Nitrous oxide	...	...	...	12
Ethyl chloride	...	...	...	6
Spinal	...	...	...	8
Scopolamine	...	...	...	2
Hedonal	...	...	...	2
Local	...	...	...	6
Not specified	...	...	...	158

TABLE II.

Age of Patient.

Under 6	...	...	...	91
6 to 15	...	...	...	124
16 to 25	...	...	...	82
26 to 60	...	...	...	338
Over 60	...	...	...	57
Not mentioned	...	...	...	8

TABLE III.

Sex.

Males	...	...	...	421
Females	...	...	...	275
Not indicated	...	...	...	4

TABLE IV.

Apparent Cause of Death.

Anæsthetic	...	...	...	521
Operation	...	...	...	37
Both	...	...	...	100
Concomitant cause	...	...	...	135

TABLE V.

Nature of Operation.

Expediency	...	...	...	173
Necessity	...	...	...	499

TABLE VI.

Stage at which Death occurred.

Before operation	...	...	...	223
First fifteen minutes	...	...	...	181
During operation	...	...	...	119
At end of operation	...	...	...	80
After operation	...	...	...	83

TABLE VII.

Complicating Factors.

Malignancy	...	...	...	85
Embarrassed breathing	...	...	...	236
Suffocation	...	...	...	39
Status lymphaticus	...	...	...	60
Single-handed	...	...	...	8
Local and general	...	...	...	6
Adrenalin	...	...	...	3

TABLE VIIA.

Analysis of "Embarrassed Breathing."

Tonsils and adenoids	...	...	...	56
Empyema	...	...	...	39
Dental extractions	...	...	...	21
Resection of septum	...	...	...	13
Cleft palate	...	}	...	107
Abscess of neck	...			
Bronchitis	...			
Carcinoma of mouth	...			
Goitre	...			
Glands of neck	...			
Diphtheria	...			
Foreign body	...			

DISCUSSION.

The PRESIDENT (Dr. Blumfeld) said that from a scientific point of view a coroner's inquest was of very little value and the lay press account of the same was of even less. Consequently he thought Dr. Flemming's energy and industry had been spent upon a field that was not worthy of such good work. Essential details were lacking in accounts such as the reader of the paper had had to rely upon, and the mere figures were therefore of little value. The publication of these fatalities did little good; for the public were apt to draw the lesson, not that they should be careful to choose an experienced anaesthetist, but that if they had to take an anaesthetic they would very likely die. They did not realize that many of these accidents were preventable.

Sir FREDERIC HEWITT said that he took a keen interest in Dr. Flemming's paper because it clearly demonstrated the pressing need of certain reforms in regard to deaths connected with anaesthetics. It was simply appalling that so little notice was taken of the unnecessary wastage of human life which so often occurred. Whilst it could not be denied that many of these 700 fatalities were unavoidable he (the speaker) had no doubt in his own mind that in a large number of the cases—possibly in the great majority—life might easily have been saved had the proper anaesthetic been used and the administration been conducted by an experienced administrator. Dr. Flemming's statistics lent great weight to the contention lately put forward by Dr. Brend, that the coroner's court, as at present constituted, was not only useless but harmful, when it essayed to inquire into deaths connected with anaesthetics. It was little short of a farce for coroners' juries to express views as to how and why patients died during surgical anaesthesia. It was the duty of the medical profession to combine, and to urge the introduction of some kind of private inquiry as a substitute for the present coroner's inquest. Such an inquiry should be conducted by a trained medical man, with or without an expert assessor. The present system was useless, because the information asked for and obtained was not suitable for scientific and statistical purposes; it was harmful, because it inflicted unnecessary pain and discredit upon the relations of the deceased and the medical practitioner. One of the recommendations of the Home Office Departmental Committee, appointed a few years ago, to consider, *inter alia*, the administration of anaesthetics, was to the effect that "a small standing scientific committee on anaesthetics should be instituted under the authority of the Home Office"; but this recommendation, like others, had become a dead letter. Such a committee would be most valuable as an intermediary between the private Home Office inquiries on the one hand and the various professional and educational bodies on the other. Amongst the latter bodies he might mention the Section of Anaesthetics he was now addressing, the General Medical Council, and the British Association for the Advancement of Science. He (Sir Frederic Hewitt) was aware that

the Royal Society of Medicine, being essentially a scientific body, was disinclined, if not unable, to take any part in the reforms which were needed. But surely the matter was of such moment that the Section of Anæsthetics might, as a scientific body, further the introduction of reforms and work in conjunction with other bodies to remedy the existing defects in medical practice? The two other bodies to which he had referred—viz., the General Medical Council and the British Association for the Advancement of Science—already had Anæsthetics Committees. The Committee of the General Medical Council, however, as at present constituted, existed only for the purpose of considering any proposals for legislation. Possibly it might be found practicable for the functions of this Committee to be extended, so that it might from time to time advise the Council as to what regulations should be issued to the profession in regard to the selection and use of anæsthetics. Similarly, the Anæsthetics Committee of the British Association would also issue reports and recommendations. In this way the Home Office Committee would, on the one hand, be in touch with the General Medical Council, the British Association, and the Royal Society of Medicine, whilst it would, on the other hand, receive the reports and statistics furnished by the private inquiries conducted by its officers upon deaths during anæsthesia. The machinery thus established would be of the utmost importance to the community. There could be no doubt that had ether been used in the great majority of the cases, or had chloroform been administered by the percentage system, many lives would have been saved. Surely there should be some such machinery as that suggested for the guidance of the profession—machinery by which the General Medical Council would issue regulations for the safety of patients during anæsthesia, and by which the Home Office Anæsthetics Committee could obtain reliable statistics as to the frequency of deaths under anæsthetics, and other particulars.

Dr. LEVY, in reply to Dr. Flemming's inquiry, said that there had been no respiratory obstruction in those animals in which cardiac syncope from ventricular fibrillation had occurred during recovery from chloroform narcosis. He considered that undue stress had been laid upon the danger of an asphyxial condition arising during the administration of chloroform. He pointed out that the number of reports of inquests on deaths under anæsthetics had risen from 83 in 1899¹ to over 200 per annum in recent years, according to Dr. Flemming's statistics. The fatalities occurred mainly under chloroform, or mixtures containing chloroform, and in view of the fact that chloroform was becoming largely supplanted by other methods of producing anæsthesia, and whilst less used showed an increasing mortality, these figures suggested that there was something wrong with modern methods. The prevalent teaching in insisting on the extreme attenuation of the percentage of vapour administered had done nothing to diminish the number of chloroform fatalities, and

¹ Jas. Edmunds, *Lancet*, 1900, i, p. 227.

had, in fact, in his opinion, been directly responsible for their increase. He condoled with Dr. Flemming on having to resort to the public press for statistics and reports of cases, and he strongly supported his suggestion that the Anæsthetics Section should form a bureau for the confidential reception of reports of fatalities; it was only in this way that reports of any value in reference to the causation of death under anæsthetics could be accumulated.

Mr. BOYLE congratulated Dr. Flemming on his paper and on the amount of work that it must have entailed to collect the press reports of so many cases. He felt, however, that the results obtained could not be of great scientific value, for reports of fatalities as they appeared in the lay press were notoriously lacking in the detail that was necessary for an investigation of this nature. The number of fatalities that Dr. Flemming had collected was appalling, and the more so as no doubt there were many others that had not been reported. Dr. Flemming had told them that most of administrators were men with a very limited anæsthetic experience, and that was what one would expect; and this naturally led up to the conclusion that inexperienced men ought always to give ether, and that chloroform should be left to the expert anæsthetist. The number of deaths under nitrous oxide seemed to be excessive, for he did not think that, under ordinary circumstances and with ordinary care, anyone ought to die under short gas or gas and oxygen anæsthesia. He did not, however, include in this statement long anæsthesias or patients who were suffering, as in two of the cases mentioned—(1) from prolonged toxæmia and (2) from angina Ludovici. Of the 223 who had died before the operation he gathered that the great majority had had chloroform from the start and that most of them had died during the struggling stage. In a way it was comforting to know this, because for several years it had been his opinion that to induce anæsthesia with chloroform was dangerous, and it was his practice always to induce either with gas and ether or occasionally with ether alone, and then subsequently to go on to chloroform, and if this sequence was used he felt sure that the number of fatalities would decrease. A great number of these fatalities, he felt sure, ought never to have occurred, and he thought it was high time that the public at large should know the risks they ran in allowing themselves to be anæsthetized by inexperienced men. With regard to the reporting and investigating of these fatal cases, he agreed with Sir Frederic Hewitt that the present system of coroner and jury was quite wrong and almost useless. What did a coroner's jury know about the technical details of a fatality under anæsthesia? Nothing. And no doubt in many instances the coroner himself could not help them much. He thought that all these cases ought to be investigated by a board of medical men who had some knowledge of anæsthesia and their report should be published. If, however, it was found impossible to do away with the coroner and jury system, then he offered as a suggestion that anæsthetists be appointed by the Government with adequate remuneration, who should attend all inquests on cases dying under anæsthetics to act as advisers and helpers to both coroner and jury.

24 Flemming: *Inquests concerning Deaths during Anæsthesia*

Dr. FLEMMING, in reply to the President, said that of the 223 deaths which took place before operation, as far as one could estimate, approximately 200 occurred during the struggling stage; and in practically none was there any obvious cause other than the anæsthetic. In reply to Sir Frederic Hewitt, it was encouraging to hear that at least one influential body had recently turned its attention to the matter of reforming our tribunals which were entrusted with the investigation of such matters as deaths during anæsthesia. He thought that Mr. Boyle, when he said that no patient ought to die under a single administration of nitrous oxide, must not be understood to refer to such cases as angina Ludovici. He was especially grateful to him for this one remark, "I think that in practically all cases anæsthesia can be induced by means of ether."

Section of Anæsthetics.

February 6, 1914.

Dr. J. BLUMFELD, President of the Section, in the Chair.

Intratracheal Anæsthesia.

By ROBERT E. KELLY, F.R.C.S.

YOU must all have been struck with the extraordinary revival of learning in the subject of anæsthesia. During the past ten years it has claimed the interest of the physiologist and the bio-chemist as well as that of the surgeon. So much new matter has been added to our knowledge of anæsthetics, and so many new methods have been used for their administration, that it is pardonable to speak of the science as well as the art of anæsthesia. Of all the newer methods, I wish to advocate very strongly the intratracheal method of administering ether: I do so because of this simple fact: in a large percentage of cases the only danger of ether lies in the obstruction to the respiration. The intratracheal method is an artificial respiratory method first and an anæsthetization method secondarily. Therefore, the sole disadvantage of ether is not only safeguarded but actually eliminated.

As I am introducing the discussion I would like to say a word or two with regard to its underlying principle. Quiet respiration is, of course, merely the exchange of the gases in the trachea and bronchi for fresh air. The interchange of gases in the lungs is accomplished by diffusion, the oxygen diffusing from places of high partial pressure to low; that is to say, from the bronchioles to the alveoli, and from thence to the tissues, whilst the CO_2 , following the same law, diffuses from the tissues to the alveoli and the bronchioles. It is obvious, therefore, that if a continuous stream of fresh air can be applied directly at the bifurcation of the trachea, and means taken for its escape, it might be possible to maintain efficient oxygenation even without respiratory movements. This was the crucial experiment of Meltzer and Auer. They passed a catheter about half the size of the glottis right down to the bronchi, and forced air through it at a small plus pressure. The lungs were distended with the pressure, but the excess of air escaped

between the catheter and the glottis opening. They were able to keep an animal alive even when respiration was completely paralysed by curare. By allowing the air-stream to pass over the surface of ether they also found that they could by this means anæsthetize an animal. To this method they gave the name "intratracheal insufflation." This experiment is interesting from three points of view. It interests the physiologist because it proves that the movements of respiration are not essential to life; it interests the surgeon because it affords a simple method of combating pneumothorax; and it interests the anæsthetist because it obviates any form of respiratory obstruction. Let me amplify these three points of view:—

Physiological.—In strychnine poisoning death occurs through the spasm of the respiratory muscles, and consequent lack of oxygenation. If artificial respiration be kept up by intratracheal insufflation a dog may be given twice the lethal dose of strychnine, with recovery. I have it on the authority of Elsberg that in a case of poisoning by morphia with suicidal intent, artificial respiration was kept up by this method for twelve hours, with complete recovery. There were no movements of respiration during the whole of this time. I have used it in a case of tetanus in a boy. As soon as cyanosis set in I inserted the intratracheal catheter, and he lived for some four hours. The oxygenation, however, was not satisfactory, for the pressure of the tetanic contractions of the chest wall easily overcame the pressure of air which I thought it wise to give him. It is obvious that for efficient oxygenation the lungs must be expanded. Still, I think that in the intervals between the tetanic contractions I was able to assist his respiration in a marked degree.

Surgical.—I am confident that the introduction of this method of insufflation is the greatest single step in the march to more extensive thoracic surgery. It is an improvement on the positive and negative pressure cabinets of Sauerbruch and Brauer. These cumbersome and expensive cabinets have two great disadvantages. In the first place, owing to the fact that the thorax and the face must be in different atmospheres, it follows that either the operator or the anæsthetist must work in a confined space. They must communicate with each other by telephone. The consequence is that a rigid aseptic technique may not be possible. Now, in no other part of the body is perfect asepsis so absolutely necessary. A surgeon may be careful in dealing with the peritoneum, he must be more careful in dealing with bones or joints, and he must use the superlative degree of care if he is to do good clean work in the pleural cavity. Experimentally, it can be shown that a single

careless brush of the pleura with a dry dab is followed by empyema. In the second place, in both the positive and negative pressure cabinets respiration becomes more difficult for the patient, in intratracheal insufflation respiration is made easier. On the one hand the interchange of gases is dependent on the movement of the chest, which may be crippled by the operative procedure; on the other hand, oxygenation can go on quite independently of the respiratory movements. You may perhaps object that at the present time there is very little thoracic surgery practised, but I would like to draw your attention to the wonderful work done in the American experimental laboratories. Extraordinary work has been done on the heart, great vessels and lungs in animals. Even in the human subject Torek has reported the first successful case of removal of a portion of the thoracic œsophagus for malignant disease. After the removal of some ribs the lung was displaced; the œsophagus freed from the vagi; the growth removed and the upper end of the œsophagus brought out at the neck. This fistulous opening is now connected by rubber tubing with a gastrostomy opening. This operation was done under intratracheal insufflation.

Again, there is the *anæsthetist's* point of view. Here the main advantages are:—

(1) The anæsthetist is entirely out of the way. Perfect asepsis is easily maintained in operations about the face, mouth, &c.

(2) Operations on the kidney, spine and cerebellum, in which the position of the patient is a difficult one for the anæsthetist, are much facilitated when this method is used.

(3) It is extremely useful in the operations of the thyroid gland.

(4) It is most useful in all operations in which there is any chance of blood, pus or vomit entering the trachea (operations on the jaw, mouth, tongue, and cases of intestinal obstruction with fæcal vomiting).

(5) The extreme accuracy of the dosage. It is possible by adjusting the amount of anæsthetic used to balance exactly the amount eliminated, so that the tension of the anæsthetic in the blood remains constant. In an experiment on a dog in which gas and oxygen were substituted for ether it was possible to anæsthetize the animal all night by applying the gases at a definite and constant speed and pressure. Once this pressure had been adjusted the animal remained for hours in an unvarying depth of anæsthesia. This accuracy of dosage therefore surpasses in delicacy that of intravenous anæsthesia.

I look forward to the time when with improvements in the instrument we may be able to state accurately the amount and tension of the anæsthetic used.

Lastly, in operations in the upper part of the abdomen the lessened respiratory movements and the descent of the diaphragm facilitate manipulations about the common duct.

The instrument which I use has been made for me by Messrs. Down Bros. They have kindly set it up for your inspection, and as it has been described elsewhere I need not now discuss it in detail. The sole difficulty for the beginner is in passing the intratracheal catheter. I find that the Chevalier Jackson instrument is the best, and if the newer form with the side opening is used the operation becomes easy after a little practice. For the past two years we have used this method in the Liverpool Royal Infirmary. We limit its use to those cases in which the method is distinctly applicable. It has been used now in nearly 300 cases, and so far I am extremely pleased with the results. Vomiting is rare, there has been no fatality, and it is exceptional for any complaint to be made of sore throat after the operation. I consider that for selected cases it is the best method of anæsthesia up to the present time.

Intratracheal Anæsthesia.

By H. E. G. BOYLE.

I TAKE it that most of us are now familiar, if not from personal use, from our reading, with the fundamental principles of intratracheal anæsthesia, or, as I believe we should speak of it, endotracheal anæsthesia; and so I do not propose to enter into the details as to how the anæsthesia is produced. I shall begin with the fact that good anæsthesia has been and can be produced by this method, and shall now proceed to go briefly into the type of case that I consider most suitable for this method, and to give you my reasons. And here let me at first say that I do not consider the method suitable or advisable for all cases. In these days of new methods and new ideas there is a very great danger that men will be found who will claim that each new method as it comes out is absolutely and finally the very best thing for every operation, and they will push that particular method until they either bring it into disrepute or find some newer toy to take its place. We all of us know the claim ethyl chloride made on some people, and does still in some cases. Nor is it ancient history to recall the fact that infusion anæsthesia was hailed in some quarters as the best thing for everything and everybody. We were told first that ether infusion was the absolute

and final "it"; then the advocates of hedonal came along and claimed that at last we had reached the summit of our wishes. During the Congress we had gas oxygen, rectal ether, endotracheal ether, and all the rest.

Well, gentlemen, between all these splendid methods we have to make a choice, and it behoves us as reasonable men to make that choice with some discrimination and care. It is, I believe, quite impossible to say with any degree of truth that any one method is the best for everything. As specialists in our branch of the profession, we ought to make ourselves familiar with and skilled in every known method of producing anæsthesia, so that we should be able to decide what anæsthetic or what method should be employed; and we ought always to be given the opportunity of seeing our cases beforehand, so that we may be able to decide which method is best, both in the interest of the patient and the surgeon.

After that slight digression, let me proceed to tell you the cases or types of case in which I consider endotracheal anæsthesia to be of the most service. To begin with, we will all agree that it is pre-eminently suitable for intrathoracic surgery. My experience of this type of case is limited to ten cases, but in all of these I was struck by the easy anæsthesia and the feeling for myself (and so for the patient) of absolute safety. One of these cases particularly comes to my mind. It was that of a doctor who had pneumonia, and an empyema, and had been left with what I believe was a pyo-pneumothorax, or, at any rate, an abscess cavity in his lung. He was in a very bad state, and it was obvious that any prolonged surgical operation would be fraught with great danger. He was coughing up quantities of foul-smelling, purulent matter, and as his condition had been diagnosed, and they had decided to drain his lung, I was called in to administer the anæsthetic. I decided to anæsthetize him with chloroform and ether, and to proceed with endotracheal ether. I did so, and soon after the catheter was in place I blew up about 3 oz. of purulent matter from his larynx and trachea. And now comes what to me was the interesting point: When Mr. Wilson (the surgeon) got through the lung (for he had to go right through a part of it) he came upon a cavity which was empty, and which, from its size, would have contained about 3 oz. of pus. As far as the anæsthesia was concerned the patient did admirably, but I ought to say that he died about three months later from sepsis and absorption. The other chest cases include the extensive removal of ribs for old empyema sinus, abscess of lung, empyemata, and thoracotomy. They have all done well. I have not yet had an opportunity of having

both sides of the chest open at once—I am hoping for it. The next type of case that I consider this method suitable for is for operation on the thyroid gland, goitres, both simple and exophthalmic. I have now used this method in twenty such cases, and I have been more than pleased with the results. The easy anæsthesia, and the feeling that the surgeon may pull on the growth with impunity, and that the patient is absolutely safe all the time, makes me think that this is an ideal method for these cases. I would, however, remind you that it is unwise to allow the surgeon to pull on the trachea to the extent of kinking it, for then the ether-laden air cannot escape, and in consequence the pressure within the chest becomes too great.

For those surgeons who like their goitre cases to be straining a little before the end of the operation, this method should appeal strongly, for it is very easy to turn off the ether and give air for a few minutes and then to suddenly turn on the ether again. This manœuvre will invariably make the patient cough and strain, and it is astonishing at first to see how easily and quickly this manœuvre can be carried out. In some of the goitre cases I have run oxygen over the ether instead of air for a part of the time, with satisfactory results; the oxygen appears to be particularly useful at the close of the operation, as, after giving it for a few minutes free from ether, the patient shows signs of returning consciousness and returns to bed in an almost conscious state. On this question of combining oxygen with the anæsthetic agent, Gwathmey, in his presidential address to the American Association of Anæsthetists, says: “Carefully conducted experiments and clinical observations have abundantly proved that *oxygen increases the value of all anæsthetics in rendering them safer to the patient* without decreasing the anæsthetic quality.”¹

I have recently given endotracheal ether in a case of exophthalmic goitre for Mr. Gordon Watson with every satisfaction to him. The only feature which was not entirely satisfactory to me was that I bruised the fauces whilst introducing the catheter, and so the patient had a sore throat for three days afterwards. I think that this method is particularly suited to almost any operation in the neck, as the anæsthetist is well away from the field of operation and does not hinder the surgeon. So far I have not had an opportunity of applying it to brain surgery, and shall be glad to hear the experiences of others on this point. I have used the method for resection of the septum nasi, but the opinion of the

¹ *Ann. of Surg.*, Philad., 1913, lviii, p. 872.

surgeon was that there was too much bleeding, and this is not to be wondered at when one considers what a beautiful pink colour the face usually has during the anæsthesia. I have done one case of cleft palate in a boy aged about 7, with excellent result. The method appears to be satisfactory for removal of upper jaws, though there is a certain amount of blowing out of blood on the surgeon's face which he may not appreciate.

There has been in my short experience of this method one man who undoubtedly owes his life to endotracheal ether. This was a man who had an extensive removal of glands of the neck, and also removal of part of the tongue and fauces through the neck. The operation had gone extremely well, when, just as the bandages were being applied, there was a sudden and sharp hæmorrhage. Fortunately, I had not yet removed the catheter, and so the blood was blown away from the trachea. The wound had to be opened up, and it was then found that a ligature had slipped from a large vein. I am perfectly certain that, but for the presence of the tube in the trachea and the method, this man would inevitably have been drowned, whereas his bleeding was stopped, and he made a subsequently uninterrupted recovery.

Amongst my cases there have been two of broncho-pneumonia, and five of sore throat, following the administration; no cases of aphonia, and no deaths. Nearly all of my patients have been given morphia and atropine before the operation, but I have not thought it necessary to cocaine the larynx in any of them. From my experience of the method, I think that the most difficult part is the introduction of the catheter; even with a Hill's tube it is not always easy, but, like most other difficult things, this will no doubt become easy when one is more accustomed to it.

Intratracheal Anæsthesia.

By F. E. SHIPWAY, M.D.

THIS method is of interest and practical value to the physician as well as for the surgeon and anæsthetist. It concerns the former because it is essentially a method of artificial respiration, and I should like to emphasize this point and endorse Mr. Kelly's remarks. Mr. Kelly has told us of a case related by Elsborg of a medical student who had taken an overdose of morphine, and was kept alive for a period of twelve hours by intratracheal insufflation until respiration returned. I believe

there are other similar cases on record. I have had an interesting experience, which enforces this lesson. It was a case of tetanus in a young man; an injection of antitoxic serum was made into the left lateral ventricle, and was shortly followed by wide dilatation of the pupil, complete cessation of breathing, and increasing cyanosis. The pulse became quick. As intratracheal ether was being given, I turned off the ether, connected up an oxygen cylinder to the apparatus, and increased the speed of the air-stream. Colour, pulse and pupil rapidly returned to normal, but it was not until at least two minutes had elapsed that spontaneous respiration returned. During this time the patient was obviously being efficiently oxygenated. We can claim then that the method is perfectly safe.

For the surgeon and to the anæsthetist there are many advantages which I have previously described,¹ and shall only discuss shortly to-night:—

(1) A free air-way is always present. It will be generally admitted that the chief difficulty in inhalation anæsthesia is to secure an unobstructed intake. If we look at the type of anæsthesia in non-inhalation methods—e.g., intravenous, oil-ether *per rectum*, anæsthesia through a laryngotomy or tracheotomy opening—we see that they are all characterized by quiet, even narcosis. The reason is that the irritating anæsthetic vapour is not introduced through the upper air passages, and does not cause congestion or spasm of the parts bounding them. Mucus formation is also slight. The anæsthesia is not complicated by irritation of the superior laryngeal and trigeminus nerves. In intratracheal insufflation, moreover, the catheter always keeps the larynx patent. Cyanosis cannot arise and aeration is always perfect.

(2) Combined with this is an even and constant administration. The delivery of the vapour is automatic. Anæsthesia is at a uniform level, and can be kept remarkably light, besides being under precise control.

(3) The power of excluding blood, &c., from the larynx and lungs makes it without doubt the best method in the surgery of the mouth and pharynx. A light, uninterrupted anæsthesia can be kept up, the field is clear for the surgeon, there is no anxiety about the inhalation of blood or pus, bronchitis or pneumonia do not occur, after-vomiting is in my experience almost unknown, and patients come quickly out of the anæsthetic. I have used this method in over forty cases of this type; twenty-eight were cases of epithelioma of the jaw, tongue, floor of

¹ *Brit. Med. Journ.*, 1913, ii, p. 1621.

mouth, tonsil, &c. The average age of the tongue cases was 62; the oldest patient was 71.

(4) The field of operation in face, head and neck cases can be kept sterile.

(5) In abdominal operations, especially above the umbilicus, relaxation is very good and the respiratory movements slight, so that in nearly all cases the conditions are very favourable for the surgeon. I have been a little disappointed in a few cases where I have not been able to obtain relaxation. I must admit they were all extreme types—e.g., the hard, muscular stoker—and I have had to resort to deep chloroform or C.E. anæsthesia for the sewing-up; they are, however, the exception. In nearly all cases light anæsthesia (of a lightness impossible with inhalation methods) has co-existed with a quiet, flaccid abdomen.

(6) Shock is diminished. I have noted this in many cases now. Dr. Pembrey tells me that the gas analyses in our cases prove that we have not used excessive ventilation. The CO_2 percentage has not departed from the normal. Certainly, from the character of the anæsthesia, and remembering that the method introduces the anæsthetic and does the breathing, and *not* the patient, one would expect less strain on the circulatory and respiratory systems.

I have used this method in 245 cases. Indications for its use:—

(a) Since it is primarily a method of artificial respiration it follows that it can be used to great advantage in every case in which respiration is, or is likely to be interfered with—viz., by mechanical obstruction (e.g., goitre), by the surgical procedure (e.g., neck operations), by position of the patient (e.g., renal and spinal cases), by diseases connected with the central nervous system, as in cerebellar tumour, by habits or physique of the patient (e.g., alcoholic, stout, thick-necked individuals), &c.

(b) Operations on the nose, mouth and pharynx.

(c) Operations on the face and head.

(d) In debilitated, exhausted, or cachectic patients.

(e) Operations upon the upper abdomen.

Complications, Sequelæ.—Vomiting is nearly always absent, and if present is slight. I have not met with severe vomiting. Young girls and boys have frequently after long operations not vomited at all. In my experience the mouth and throat cases in young and old have been free from the sequelæ. Laryngitis, one case. Bronchitis, three cases, one very slight, two acute (gastro-enterostomy); all recovered. The two latter were difficult subjects to relax. Some patients had chronic bronchitis at time of operation; one case of Graves's disease of a mild

type had an exacerbation lasting twenty-four hours. Two patients (prostatectomy) were aged 72 and 78 respectively; no bronchitis ensued. The age of the mouth cases has also been high. I do not think that intratracheal insufflation is more liable to produce post-anæsthetic pulmonary trouble than other methods; in fact, I think the reverse is true. I refer those interested to the references already published.¹

I do not intend to say anything about technique except on the subject of warming the vapour. Some apparatus cannot deliver a warm vapour; some anæsthetists attach no importance to this point. I cannot but think that they are wrong. I have heard the argument advanced that in the Polar regions men breathe air at temperatures which are constantly many degrees below freezing point. This is true, but the air is warmed up to body heat on its passage through the nose, mouth, pharynx, larynx and trachea before it reaches the lungs, and in its warming up by these surfaces abstracts heat from them, and, therefore, from the body. We want to put our patients into better conditions than those met with in cold regions. They are not in a comparable state. The efforts of the surgeon and anæsthetist are directed towards preserving the heat of the patient with a view to minimizing shock; to blow air and ether vapour at room temperatures at the rate of 17 to 25 litres per minute directly on to the surface of the lungs is to nullify our endeavours, to do in fact the very thing we take such care to avoid. The apparatus which I show to-night has been so arranged that a warm vapour at body temperature can be easily obtained, and a few experimental observations will soon show the temperature at which the water in the heating chamber must be kept to allow for the fall in the passage of air and ether vapour along 3 ft. of rubber tubing. It is the easy and obvious duty of the anæsthetist to maintain the temperature at this point.

Physiological Observations upon Intratracheal Anæsthesia.

By M. S. PEMBREY, M.D.

THE method of anæsthesia developed by Auer and Meltzer presents problems of great physiological interest. From this point of view observations have been made in conjunction with Dr. Shipway upon the respiration, pulse and temperature of patients who have been sub-

¹ *Brit. Med. Journ.*, 1913, ii, p. 1621; *Brit. Journ. Surg.*, 1913, i, p. 107.

jected to intratracheal anæsthesia during surgical operations. The blood-pressure of some of these patients has been investigated by Mr. G. Marshall. The rate of ventilation through the catheter has been about 16 litres per minute; the extremes in different cases were 8 and 30 litres per minute. Analyses of the expired air, the air of the dead space and the alveolar air were made to determine the discharge of carbon dioxide and the absorption of oxygen; in this way it was possible to obtain evidence upon the questions of acapnia and the excitability of the respiratory centre. A ventilation of 30 or more litres of air per minute produced apnœa by removing the carbon dioxide too rapidly from the blood, but the pulse in this condition was very good and the blood-pressure was 150 mm. Hg. Such an apnœa is unnecessary in an ordinary operation and inadvisable, for the respiratory movements are of value in several ways. From a mechanical standpoint the exchange of gases in the lungs is favoured by the alternate expansion and contraction of the lungs. The respiratory movements indicate that the pressure of the entering air is not too great for the respiratory muscles weakened by the anæsthetic. The rate and depth of breathing are an indication of the activity of the respiratory centre in the medulla oblongata. Moreover, a guide to the adequacy of the ventilation is obtained by a comparison of the rates of breathing during the insufflation and after the insufflation has been stopped for a minute or two by disconnecting the tube without removal of the catheter. The analyses of the alveolar air showed that with a ventilation of about 16 litres per minute the pressure of carbon dioxide was between .5 and 6 per cent. of an atmosphere, and the respiratory movements were, as one would expect, definite.

The ease with which a state of light anæsthesia is produced and maintained by this method is one of its outstanding merits. This would be expected when it is recognized that the volume of air, its temperature, moisture and percentage of ether are all under control.

DISCUSSION.

Mr. GEOFFREY MARSHALL wished only to record his observations on the blood-pressure during intratracheal administration of ether. These observations were made on patients in conjunction with Dr. Shipway and Dr. Pembrey. The systolic pressure of a brachial artery was registered by means of a Riva-Rocci apparatus. In this way readings could be taken every half minute. Curves were then plotted. Comparing these curves with those obtained in other methods of anæsthesia, one was struck with the following points: There

was no marked fall of pressure even during a long operation ; in each of these cases at the end of the operation the blood-pressure was found to be within a few millimetres of mercury of that at the beginning ; during the operation there were constant oscillations of 5 to 10 mm. about the mean pressure. A given "insult" would produce as great a rise in pressure during the later stages of an operation as in the earlier. This was well shown in the case of a man operated on by Mr. Steward for fracture of the bones of both legs. Driving screws into the right tibia caused a rise in pressure of 9 mm. (125 to 134). Fifty minutes later driving screws into the left tibia produced a rise of 11 mm. (130 to 141). This might probably be taken to indicate that the amount of shock induced was small. It was interesting to note the blood-pressure changes in the case in which apnœa had been produced by rapid ventilation. As Dr. Pembrey had mentioned, ventilation was going on at the rate of some 30 litres per minute. Air was being given unmixed with ether. At the commencement of this rapid ventilation the blood-pressure was 155 mm. After a minute it had fallen to 138 mm. Apnœa was then observed for two minutes. During this time the pressure gradually rose again to 150 mm. The patient then commenced slow voluntary breathing. The excessive ventilation had washed out the alveolar carbon dioxide (and the blood-pressure fell). During the apnœic period CO₂ accumulated and the blood-pressure rose. A sample of alveolar air, taken when respiration recommenced, showed CO₂ percentage 6.04, which is about normal. During the course of this operation Dr. Pembrey took four samples of alveolar air for analysis. The determinations showed, as usual, that the blood-pressure followed the CO₂ tension—where the tension of CO₂ was high, so also was the blood-pressure ; where the CO₂ tension fell the blood-pressure fell also.

Dr. WILLIAM HILL remarked that the previous speakers had dealt only with the insufflation under pressure of anæsthetics and of oxygen by means of oro-tracheal intubation. Hyperpressure was, of course, necessary in thoracotomy operations and as a substitute for artificial respiration, but pressure was neither essential nor even advisable when endotracheal intubation anæsthesia was employed in operations not involving thoracotomy. For goitres, for instance, anæsthesia through an oro-tracheal intubation apparatus administered by the aid of a funnel or a Junker's appliance, with ordinary in-and-out natural respiration, was all that was needed, and, moreover, avoided the possible danger of hyperpressure on the alveoli. He nearly always employed an endotracheal anæsthetic tube in œsophageal work, and frequently in other operations where there was any tendency to obstruction of the larynx or trachea from spasm or from pressure, &c. In order to prevent blood entering the air passages in sanguinary operations in the nose, buccal cavity, and throat, he preferred a modification of his own of Kuhn's principle to the recent method of hyperpressure through an endotracheal tube, which had been so strongly advocated that evening. Instead of using Kuhn's cumbersome and expensive apparatus, he had merely added a thin rubber wide collar to a large-sized oro-tracheal

catheter; this collar was attached 2 or 3 in. from the distal end, and, when inserted, rested on the ventricular bands and sealed the laryngeal airway, except through the lumen of the gum-elastic tube. The mouth of the larynx and adjoining pharynx could be, if necessary, further plugged with a long strip of gauze. This special tube with the rubber collar collapsed like a closed umbrella, and was easily introduced through his (Dr. Hill's) special direct-vision slotted laryngoscope, which had necessarily to be of a larger lumen than the modification used by Dr. Shipway for ordinary tubes.

[Dr. Hill then showed two patterns of laryngoscopes, one of which could be used either with a Kirstein forehead lamp or with a Brünings's handle-lamp, and the other had a small lamp near its distal end. The method of introducing the tubes through these direct laryngoscopes was demonstrated after the meeting on a patient under cocaine anæsthesia.]

Dr. G. A. H. BARTON said his experience of the endotracheal method was limited to the administration of chloroform or ether through a Junker's apparatus connected with the tube. Thanks to the courtesy of Mr. Boyle he had, however, seen his apparatus in work and was struck by its simplicity and efficiency. He thought the endotracheal method had only a limited application and that for ordinary cases it offered no advantages; many of those claimed by previous speakers for the method were merely the advantages of alkaloids and open ether. Whatever apparatus was used, practically the sole difficulty lay in the introduction of the tube, and this was rendered fairly easy by the use of Dr. Hill's improved direct-vision laryngoscope. In order to avoid humiliation, Dr. Barton found it was well to take every opportunity of bringing into view the vocal cords with this instrument, and with this object he had always taken it to hospitals with him and with the consent of the surgeon passed it at the termination of any operation. Dr. Barton had heard of one objection raised to the use of apparatus driven by foot-bellows. On a recent occasion he was giving chloroform with a Junker's apparatus and foot-bellows; at the end of the operation the surgeon informed him that a colleague of his refused to allow the use of foot-bellows, as he objected to his patient being supplied with "septic" air from the floor of the theatre. Dr. Barton's reply to this was that the air supplied by him was filtered and sterilized in its passage through chloroform. It was a question, however, whether in the use of some the apparatus for endotracheal ether insufflation the air could be said to be sterilized in its rapid passage over the surface of ether, though no doubt it was filtered in passing through warm water. He thought the point was one of minor importance, but would like to hear the opinion of others.

Mr. T. B. LAYTON said that he had had the opportunity of doing operations for which Dr. Shipway had administered anæsthesia by this method. For operations on the nose and throat he liked it very much. He had not met with the difficulty to which Dr. William Hill had referred; he thought that if the blood was being blown back into the operator's face it meant that there was too much bleeding and that it was time to stop and control the hæmorrhage.

If the blood were in excess it easily could be mopped away from the back of the throat; if there were only a small amount there it could do no possible harm. In fact, a very great advantage of the method was that there was no need to stop continually to mop up every trickle of blood that passed to the back of the mouth.

Dr. W. J. MCCARDIE said that the weak point about intratracheal etherization was that the depth of anæsthesia required for the introduction of the laryngeal catheter was often far greater than that needed, or even safe, during the operation, as for instance in cases of goitre and intestinal obstruction. During operations in or about the upper air passages it was usually fairly easy to make sure that no blood entered the air passages when using this or other methods. The best and most trying test of the utility of intratracheal anæsthesia would be that of its efficiency in preventing those deaths which occur by drowning from inspiration of fæcal vomit in cases of acute intestinal obstruction. At present we had no efficient means to prevent this, and we relied upon posture. Dr. McCardie suggested that the method should be tested in a series of these cases, but was doubtful whether the return current of air would be powerful enough to prevent inspiration of vomit when the mouth was suddenly and silently flooded with fæcal fluid. The weak point he mentioned above arose here very forcibly, and he thought that the induction of deep anæsthesia alone or the introduction of a catheter during such deep anæsthesia would at once provoke vomiting and rapid emptying of the stomach. In these dangerous cases the method, if efficient, would save many lives.

Mr. KELLY, in reply, referred to the fact that it never was necessary to produce apnœa. Whilst respiration was still going on the anæsthesia was safe. Though it was possible to stop respiratory movements altogether this procedure was unnecessary. In a dog, respiration had been stopped for twelve hours before the heart failed, so that even if the respiration did cease there was still a large margin of safety. He thought that Dr. Hill, in going back to endotracheal anæsthesia without pressure, had entirely missed the principle of intratracheal insufflation. Moreover, the rubber collar on the catheter prevented the end of the catheter from being seen, and the method of passing the catheter was really almost as blind a proceeding as passing it without a laryngoscope. Mr. Kelly thought that with the patient fully under, the application of cocaine to the larynx was unnecessary and a waste of time. He agreed with the speaker who advised smaller tubes in goitre cases and stated that a small tube might be made relatively larger by a slight lateral pressure with two fingers on the hyoid bone. He emphasized the necessity of keeping the neck clear from pressure. The spitting of blood on to the surgeon's face, he thought, denoted a poor assistant.

Section of Anæsthetics.

March 6, 1914.

Dr. J. BLUMFELD, President of the Section, in the Chair.

Discussion on Posture in relation to General Anæsthesia.

Opened by W. J. McCARDIE, M.B.

THE importance of posture in general anæsthesia can hardly be exaggerated. The various positions have been admirably described and illustrated in Sir Frederic Hewitt's work on "Anæsthetics"—therefore, I intend to limit myself to a short, and I fear incomplete, consideration of the influence of some of them.

Variation of posture may affect (1) respiration through either the air passages or lungs themselves; (2) it may affect circulation by its influence on the heart's action and also on the blood-vessels; (3) it may affect the nerves, particularly in the limbs; (4) it may affect the muscles and joints in the way of strain, and post-operative aches and weakness; (5) it may affect the internal organs, as, for example, the stomach, intestines or kidneys.

Let us consider the posture of a healthy sleeping child. It lies nearly on its side and more or less curled up, that is to say, with all its joints (including the vertebral) moderately flexed. This is the natural position, that of greatest ease, and the best for anæsthesia.

With regard to the fixation of large joints during anæsthesia, I would lay it down as a rule that they should never be flexed or extended beyond a right angle. Instances will at once occur to us in which prolonged hyperflexion or hyperextension of certain joints—e.g., the shoulder or the hip—has injured nerves or embarrassed breathing, or both. As a rule, then, all the joints (including the

vertebral) should be slightly flexed—i.e., in the position of the greatest ease. Another general proposition I would make is that in operations on the upper part of the body, where the nature of the anæsthetic or the needs of the operator do not contra-indicate it, the head and shoulders should be slightly raised in order to lessen oozing and to decrease the amount of the anæsthetic. The need for the escape of mucus will not hinder the raising of the head and shoulders, because its secretion should be stopped by the administration of atropine or scopolamine. On the contrary, in operations on the lower part of the trunk and legs the head and shoulders should be just a trifle lower.

With a view of eliciting discussion, I propose now to make a few remarks on posture during operation on the various regions of the body. Let us begin at the top. In operations on the brain and spinal column the help of elevation may be invoked to lessen hæmorrhage. If the patient is to be laid prone, as for certain brain operations, a separate head-rest, such as that I think used by Harvey Cushing, is advisable, and in order to relieve the respiratory machine as much as possible hard pillows should be placed beneath the clavicles and the iliac crest. Coming now to operations on the mouth or air passages, posture, as a rule, must be subordinated not so much to the lessening of congestion as to the escape of blood from the air passages or the prevention of its entry therein; hence in most cases it is advisable that the head and neck be just so much lowered that the flow of blood will be towards and out of the mouth, and that congestion will only be slight. On the other hand, if methods are to be adopted which absolutely shut off the air passages from the site of operation, it is better to raise the head and neck, as, for example, during the use of Crile's tubes or Hahn's tampon cannula. It is affirmed that during intratracheal etherization the entry of blood into the air passages is prevented by the force of the return current around the catheter. This, I presume, holds good during the horizontal or lowered head position of the patient; if it also holds good when the head and shoulders are raised, this method will be the more valuable because it will allow of the advantage of greater anæmia of the parts during the operation. Possibly in this case the pressure at which the etherized air is delivered may be raised a little beyond that usual, in order to increase the force of the return current. I should be glad to hear from those who are skilled in intratracheal anæsthesia if they find that the return current is powerful enough to prevent blood entering the larynx when the head and shoulders are well raised or the patient is in the sitting posture. If intratracheal anæsthesia be used for opera-

tions about the head, neck, or chest, posture as regards mechanical obstruction of the upper air passages need not be considered.

A method of ensuring free breathing, which has been much advocated abroad, is that of Witzel, who places the head in what he calls forcible dorsal reclination over the end of the table. This method is opposed to the principle that flexion is better than extension, particularly for respiration, and causes strain on the chest. On the other hand, it has the advantage that mucus and foreign matters collect in the nasopharynx and cannot be inspired, although they may enter the nasal sinuses.

A few words as to anæsthesia when the patient is sitting upright in a dental chair. The principle of flexion applies: the neck should be, if anything, a trifle flexed, and the thighs and knees should be flexed to a right angle. To help to secure flexion, and to prevent movement and purchase for muscular spasm in the chair, we have had made at the Dental Hospital in Birmingham a special chair, in which the seat is at less than a right angle to the back, and the footboard is set at an angle of about 75° to the leg part of the chair. The back, seat and the footboard are covered with corrugated rubber, which grips the patient's clothes and feet somewhat, and tends to prevent slipping and extension of the body and limbs. Instead of the ordinary footpiece there is merely a flat board at an angle of about 15° with the horizontal line, so that if the patient's feet shoot out they cannot be caught in any projection or hollow, and therefore get no purchase. I prefer the dental chair for operations on the Gasserian ganglion, and keep the patient sitting bolt upright.

With regard to anæsthesia in the sitting posture, Chaldecott says that he has administered chloroform for six years to patients of all types and ages sitting quite upright, and his opinion is that in nose and throat operations under chloroform the upright position is the safer, and the alleged danger of syncope does not occur, even in subjects of chronic asthma, cardiac dilatation, or goitre, because breathing is easier when sitting up than lying down. We must remember, however, that he induces anæsthesia rapidly with gas and ether, and that his operations apparently were only those that needed a light anæsthesia. Personally, I very often give chloroform as he does after induction by ethyl chloride and ether for prolonged dental operations. By the way, I should like here to join with Sir Frederic Hewitt in his condemnation of the semi-recumbent posture for dental or other operations. It is the worst one possible.

In operations on the upper part of the body, especially those in which there is likely to be free bleeding because of the vascularity of the parts or extent of the wound, I think it is wise if ether is being given slightly to raise the head and shoulders. This will lessen hæmorrhage and congestion, and even from the commencement of induction, according to Hornabrook, less ether is needed. Besides, the anæsthetist has something to fall back upon should danger arise, because he can flood the vital parts with blood by lowering the head and shoulders.

In operations on the breast the arm should never, or for as short a time as possible, be extended beyond a right angle, particularly in stiffly built, fat people, because of the danger of brachial paralysis.

In operations on the lung and pleura we have to remember that the sound lung must lie as free as possible and that its bronchus should be above the level of the bronchus of the unhealthy organ, so that no infection of the sound one can take place. To help in this some slight degree of the raised pelvic position should be utilized.

A few words as to the movements of the diaphragm as shown by radiography. During ordinary normal breathing the diaphragm only moves about $\frac{1}{2}$ in., but with forced respiration it moves $2\frac{3}{4}$ in. on the left side and $2\frac{1}{2}$ in. on the right side. Hence any marked hindrance to respiration involves much strain on the lungs.

TRENDELENBURG POSITION.

Articles have been written on and many instances given of the dangers of the Trendelenburg posture. It gives much advantage to the surgeon and has many disadvantages from the patient's and anæsthetist's points of view. As has been said, anæsthetics may have been unjustly blamed for complications really induced by elevation of the pelvis. It is advisable that the inclination of the body should not exceed an angle of 45° . Here I would like to quote on the general question some remarks by Kocher. He very pertinently says: "A man cannot be expected to stand on his head for over half-an-hour without his circulation being seriously affected, and this is obvious to anyone who has a knowledge of the mechanics of the circulation and who has witnessed the copious venous hæmorrhage associated with a dependent position of the head as in Rose's operation. Obese people and those who suffer from disease of heart or vessels can often only obtain sleep without respiratory embarrassment when the head and shoulders are raised." How, then, can they safely bear the Trendelenburg posture?

Franz, who investigated the behaviour of respiration and circulation in the Trendelenburg position, found that abdominal respiration without anæsthesia was constantly weakened and thoracic breathing was little, if at all, compensatorily strengthened. During chloroform narcosis there was rather greater compensation for the weakened abdominal breathing by deepened thoracic respiration. On the whole the raised pelvic position lowered the ventilation of the lung in no small number of cases. If patients are suddenly raised to the normal position there is, with the first breath, marked lessening of abdominal and thoracic breathing, hence danger of collapse from lessened elimination. Franz asserted that there was no special damage to patients under chloroform through the Trendelenburg position and that there was very little increase in the percentage of bronchitis. He found that in the case of ether there was considerably more bronchitis after operations in the Trendelenburg than in the horizontal position.

Dr. Thomas Wilson, Gynæcologist to the General Hospital, Birmingham, some years ago, collected statistics of the relative frequency of pneumonia after operations in the horizontal and Trendelenburg postures. In 144 cases operated upon in the horizontal posture he had seven pneumonias; after the Trendelenburg there were ten pneumonias. These figures relate to a time previous to the use of scopolamine and morphine.

Franz noted in 825 cases of ether narcosis in the dorsal posture nineteen (2·3 per cent.) cases of bronchitis, while in 493 in which pelvis was raised there were forty-four cases (8·9 per cent.); 150 chloroform narcoses with the patient lying dorsally were followed by four (2·7 per cent.) cases of bronchitis and in 233 cases in the Trendelenburg position by nine (3·9 per cent.), showing that with chloroform the difference is much less marked than with ether. Franz explains that frequency of bronchitis after operations in the raised pelvic posture is due to the escape of infective mouth contents into the bronchi after the patient is raised, and suggests the advisability of carefully cleansing the mouth before the change is slowly made to the dorsal position.

To illustrate the influence of the Trendelenburg posture in the causation of pulmonary embolism I will quote Zweifel, who found that out of 1,800 operations there were eighteen deaths from pulmonary embolism. Afterwards he no longer kept the patient's legs flexed and firmly bandaged, but placed them loosely in horizontal frames. The shoulders were supported, and the Trendelenburg position was adopted as seldom as possible. After this change the deaths from pulmonary

embolism were reduced to three in 800 operations. Zweifel considers that the position favours thrombosis both by facilitating sepsis and also by its mechanical action on the blood-vessels.¹ Intestinal obstruction, surgical emphysema, apoplexy, and also acute post-operative dilatation of the stomach have been caused by this posture.

Bovée studied eight cases of ether anæsthesia and eight of chloroform anæsthesia and found that "almost no urine is received in the bladder while the Trendelenburg posture is being employed. If it can be concluded that the renal function is greatly lessened while the patient is in the Trendelenburg posture then the dangers of that posture are at once appreciated. In renal inefficiency it would seem that the use of the Trendelenburg posture would introduce a special element of danger, and this would be more marked when ether was used than when chloroform was employed as the anæsthetic."²

Hewitt records a case in which aphasia and renal hemiplegia followed operation in this position; the patient was twelve months in recovering. Kirkby Thomas noted a case in which the patient was quite blind for three days and had delusions for a week.

Gatch, Gann, and Mann³ said that a gynæcologist of wide experience once informed them that he knew of no more certain way of killing a fat woman than by leaving her for some time in the high Trendelenburg position, and they record the sudden death of a patient with aortic and mitral insufficiency and pericardial effusion who had been anæsthetized with gas and oxygen and ether in the flat position and was then placed in the lithotomy position with pelvis well elevated. They etherized dogs without any morphine and put them in the Trendelenburg position at 45° to 50° of inclination and took records of respiration and blood-pressure. The dogs died on an average in twenty minutes. The records showed that the change to head-down position caused a slight rise in blood-pressure, a slight increase in the pulse-rate, and little or no change in the rate of respiration. The breathing, however, became altered and assumed a diaphragmatic character. Respiration failed first and then pulse and blood-pressure, which hitherto had practically shown no change, also failed. It was at first thought that death was brought about by fatigue of the diaphragm, but they found that a dog under morphine narcosis will live for hours

¹ *Brit. Med. Journ.*, 1911, ii (Epitome), p. 19.

² *Journ. Amer. Med. Assoc.*, Chicago, 1910, liv, p. 1994.

³ *Ibid.*, 1913, lx, p. 1273.

in the head-down position without any sign of fatigue of the diaphragm ; a fact demonstrated by Hill and verified by them. They conclude that failure of respiration is in some way caused by the ether. They found that the ill-effects of the head-down position are due primarily to failure of respiration and were prevented if respiration were kept stimulated by hypercapnia. Gatch, Gann, and Mann also found that in dogs the heart failed much more quickly from asphyxia in the head-down than in the horizontal position. They conclude that "in normal men or animals under anæsthesia the head-down position has no ill-effects provided that the respiration is adequate and the muscles are at rest. When the breathing becomes insufficient, the entire mechanism wherewith the body compensates for the effects of gravity on the circulation is deranged. The asphyxia injures the cardiac muscle and raises the blood-pressure. The head-down position at the same time insures that every drop of blood which passes through the capillaries of the abdomen and legs will quickly return to the heart, a condition not present when asphyxia occurs with the body in the horizontal or upright position. The heart then has to pump a supply of blood at least normal against an increased arterial pressure, at a time when it is poorly able to respond to the increased strain. If the patient at this time struggles or if pressure is made on his intestines the state of affairs is rendered much worse."

The conclusion of the problem of the Trendelenburg position is that it should generally be used for as short a time as possible and not used at all in patients suffering from obesity, obstructed breathing, cardiac, renal, or arterial disease. The legs should not hang, but be supported as mentioned a little later, in order to prevent tension on the abdominal muscles and also the danger of thrombosis. The shoulders should be fixed to support the body.

With regard to posture in abdominal operations generally the principle of flexion applies, as by it muscular relaxation during operation is facilitated, strain on the back and joints is prevented, and post-operative pain and discomfort are done away with. Goldthwait has aptly pointed out that the assumption of a faulty position without support for the back and with the thighs slightly extended as in the ordinary Trendelenburg position has resulted in strain of the lumbar spine and sacro-iliac joints. He states that only those who have to do with patients suffering from weak or painful back or with chronic joint diseases can appreciate how frequently conditions of strain arise.

If a patient be in the Trendelenburg position, the legs should be kept straight, a pillow should be placed under the lumbar spine to support it and also under the thighs to prevent hyper-extension: in fact, to slightly flex them on the abdomen; thus no strain of the lumbar or sacro-iliac joints can result.¹ He writes that "if the bed or supporting structure is hard, so that the buttocks cannot settle down into it, the lumbar spine must sag downwards, and if the buttocks are large or the waist small the amount of this sag may be enough to cause painful strain on the interspinous ligaments or on the sacro-iliac joints." The result is that the strained sacro-iliac joints cause distressing backaches and possible after-disability.

These remarks apply also to the horizontal position. During gall-bladder operations, when a large pillow is placed under the liver, the patient's head should be well raised and a thick pillow placed under the thighs and legs. By this means the pull of the head and neck and of the legs will be taken from the abdominal muscles, longitudinal tension will be greatly lessened, lateral relaxation will be increased, and total relaxation of abdominal muscles and fasciæ will be much more easily obtained. I believe that post-operative backache in many cases, more particularly in muscular men, will be prevented by adopting Goldthwait's suggestion.

With regard to the placing of pillows under the liver and kidney, it is advisable that they should always be soft to prevent bruising and to allow of some movement of the ribs during respiration. A great deal of the rigidity often complained of by surgeons during abdominal operations is, I am sure, due not only to some slight degree of asphyxia but also to the mechanical strain of muscles and fasciæ, which strain can be largely prevented by a properly arranged posture.

In the lithotomy position the head, for reasons already mentioned, should be well raised, a soft pillow placed under the small of the back, and in no case should the thighs be bent towards the abdomen at more than a right angle; otherwise interference with abdominal respiration will occur.

Post-operative posture should be the natural sleeping one mentioned at the beginning of my remarks, that is to say, the patient should be laid well on the side with all the joints flexed. When he comes round, if vomiting persists the sitting-up posture will often stop it. Persistent after-vomiting may occasionally be due to some degree of dilatation

¹ *Journ. Amer. Med. Assoc.*, Chicago, 1911, lvi, p. 642.

of the stomach. If the patient be supine the stomach may not be able to empty itself, and the sitting-up position will allow of it doing this, and also allow of better lung ventilation. Occasionally we see that dreadful condition called acute dilatation of the stomach, the symptoms of which are vomiting, abdominal distension, collapse, epigastric pain, and thirst. The cause of this condition is usually mechanical obstruction contributed to by a recumbent posture. The usual treatment for this is the use of the stomach-tube, but Borchgrevink, of Christiania,¹ advocates as a cure, which is often at once brilliantly successful, the adoption of the prone posture. The patient who has been almost *in extremis* suddenly recovers. The prone posture was first suggested, he says, by Schnitzler, and has been recommended by Moynihan. The explanation of the success of this posture is as follows: The stomach does not suffer more than any other organ from the effect of the general anæsthetic, debility, &c., but it is the one organ on which demands are made almost at once after a major operation, and if the demands are beyond its functional capacity at the moment, the stomach simply abandons the attempt to respond to them. Therefore we must not make demands on the organ until it has regained its normal tone after operations, and we must refrain from overloading it. The effect of change of posture from the recumbent to the sitting in increasing lung ventilation and making easier the expectoration is well known.

The PRESIDENT (Dr. Blumfeld) said that Dr. McCardie had touched on many points of a wide subject, and there were present authorities on the different branches of surgery connected with those particular points, so that he would not himself animadvert upon them. In one particular, however, he wished to dissent from the general trend of Dr. McCardie's paper. This was in connexion with the Trendelenburg position. Dr. Blumfeld thought this position of the greatest service in obviating surgical shock; in fact, he was accustomed to think that shock could hardly occur during operation in this position, and consequently the use of chloroform when desired was possible in this position to an extent that was not safely possible under any other circumstances. With regard to position in nose and throat operations, he thought that there was this drawback to the sitting posture, that occasionally a really deep degree of narcosis was desirable, and this

¹ *Surg., Gyn., and Obstet.*, 1913, xvi, p. 662.

was not safe, as pointed out by the advocates of the sitting posture, when the patient's body was upright; with the lateral posture, on the other hand, any degree of narcosis desired could be safely employed.

Sir FREDERIC HEWITT said that eighteen years ago, in conjunction with Mr. Marmaduke Sheild, he had brought the subject of posture during anæsthesia before the notice of the then Royal Medical and Chirurgical Society. Whilst the principles at that time laid down required little or no modification, there were certain additional considerations which now deserved mention. In the first place, the raised blood-pressure which was to be secured by the Trendelenburg posture had proved to be a great boon to the anæsthetist. Whilst he had notes of a considerable number of cases of acute surgical shock during abdominal operations upon horizontally placed patients under chloroform, he had never met with this condition during similar operations under that anæsthetic when the patients were in the Trendelenburg posture. This important clinical fact seemed to him to indicate that acute circulatory depression, such as that caused by traction upon the kidney or gall-bladder, had, as its essential factor, a disturbance of the mechanism regulating the general blood-pressure—a disturbance capable of passing into syncope if the blood-pressure were at the moment of injury low, as it would be under chloroform in the horizontal posture, but incapable of causing syncope if it were higher, as it would be in the head-down posture. Whether this effect was principally vasomotor or principally cardio-inhibitory, it was not always easy to say. Sometimes the phenomena of shock, and especially of slight shock, were chiefly cardio-inhibitory in type. In most cases, however, the heart was acting and the larger vessels were receiving blood, though no pulse could be detected at the wrist—in other words, the effect was largely or wholly vasomotor. The low blood-pressure of deep chloroform anæsthesia in horizontally placed patients undoubtedly predisposed to surgical shock, for there was nothing to counteract the effects of trauma upon the vasomotor system. But thanks to the Trendelenburg posture the raised blood-pressure in all the vital parts of the body counteracted the circulatory effects produced by traction and other procedures, with the result that syncope did not take place. When the Trendelenburg posture was badly borne it was either because that posture (which favoured venous engorgement and swelling of parts within the upper air passages) led to obstructed breathing, or because it threw additional strain upon an already overtaxed right heart. In either case the remedy was the

opening up of a perfectly free and unobstructed oral air-way. There were very few patients who could not safely be anæsthetized in the Trendelenburg posture. Owing to the raised blood-pressure one could obtain with the C.E. mixture results comparable to those of "open ether" administered to horizontally placed subjects. Secondly, the subject of posture was of importance in relation to the transference of anæsthetized patients from the bed to the operating table or vice versa. He (Sir Frederic Hewitt) would lay down the proposition that such patients should always be carried in the lateral posture. If this were done the objection to anæsthetizing children in bed ceased to exist, except when such patients had to be carried up or down stairs. It would be a convenience if a stretcher with curved sides could be devised capable of keeping the patient in the lateral posture during transference up and down stairs, or along lengthy passages. Thirdly, he would refer to the fact that the Fowler posture had lately come into extensive use after abdominal operations. Apart from its value in pelvic suppuration, it certainly seemed to lessen vomiting after abdominal sections in general. In connexion with the question of posture during the recovery period, he might add that he had met with several cases which had convinced him that, whilst the lateral posture had many advantages, it was unwise to allow patients to lie upon one side for any great length of time. After prolonged anæsthetization, particularly for nose or throat operations, the posture should be changed from one side to the other every three or four hours in order to allow of the expansion of both lungs. This was particularly necessary in elderly and bronchitic subjects. Lastly, with regard to the use of chloroform in the sitting posture, he thought that great experience was necessary. Preferably induction should be accomplished by an ether sequence. In any case the anæsthesia should never be very profound. Provided, however, that respiration were perfectly free, and the corneal reflex present, chloroform might safely be given by an experienced anæsthetist.

Mr. WAGGETT thanked the President for his kind invitation to speak on the subject of the sitting posture, as he believed that its widespread adoption would be of much value to the surgery of the throat and nose. The great majority of operations upon these organs were of the minor class, and these did not demand deep anæsthesia—on the contrary, if deep anæsthesia was induced and the cough and swallowing reflexes abolished, many minor manœuvres such as the enucleation of the tonsils, the radical operation on the antrum,

submucous resection of the septum, and so forth, were converted into operations of a serious character, and fraught with no little danger. For more than twenty years he had, thanks to the co-operation of Sir Frederic Hewitt, Dr. de Prenderville, Dr. Fouracre, and other anæsthetists of experience, performed the great majority of such operations in adults in the sitting posture. *Ceteris paribus*, what was best for the surgeon was best for the patient, and if, as was the case, the sitting posture enabled the surgeon to operate in a field unobscured by blood, and therefore to finish his task with certainty and celerity, so much the better for the patient, granted that the posture entailed no extra risk.

He believed that every surgeon who had tried it agreed that the sitting posture greatly facilitated his work; an unobscured field and a normal orientation of the intricate anatomy of the nose were matters of no small importance. It remained, then, to inquire if this posture entailed special risks in light chloroform anæsthesia. He believed that dangerous vascular phenomena occurred when patients were raised to the sitting posture after initial induction in recumbency. No such phenomena were observed when administration was conducted throughout in the sitting posture. With an experience of some thousands of such cases during twenty years' practice, he could recall but three instances in which an operation had had to be finished in the recumbent position, and of each of these a special explanation was forthcoming (adrenalin injection after chloroform induction, neurosis, unsuspected pulmonary complication). The special anæsthetic difficulties in throat operations were respiratory. These were minimized by the sitting position. The sitting posture was that adopted by all sentient patients attacked with dyspnœa, whether of cardiac, asthenic, or mechanical origin; in this position aspiration of the thorax was more effective than in recumbency, and the play of the diaphragm was unhampered.

Interference with respiration during anæsthesia was often due to the approximation of the base of the tongue to the posterior wall of the pharynx; a good anæsthetist would in any posture prevent this by traction on the tongue, and by the avoidance of opening the gag too widely, but in the sitting posture obstruction of this nature had scarcely even to be thought of, once the tongue-clip was adjusted and a small weight attached to it, as the hyoid region as a whole was lengthened out by the normal downward pull upon the larynx. It might be thought that blood and mucus descending by gravity would be likely to enter the windpipe. Experience proved this not to be the case, and he could

recall no instance of such an occurrence, and the explanation was not far to seek. Every laryngologist was aware of the fact that fluids were never to be seen on ordinary laryngoscopic examination in the lower pharynx; they passed immediately into the œsophagus, and their exceptional presence in the laryngoscopic picture was taken as presumptive evidence of œsophageal obstruction. The arytaenoids, therefore, were always well above high-water mark, but in the recumbent postures, and more especially in the dorsal, fluids unaided by gravity readily collected in the pharynx and were in danger of suction into the air passages. Even in the sentient, deglutition was much embarrassed by the recumbent attitude. Finally, hæmorrhage was greatly diminished by the upright position.

To sum up: The sitting posture favoured the operator by facilitating his manipulations, and by affording him a field unobscured by blood; secondly, it automatically secured an unobstructed air-way; thirdly, experience showed that, granted equilibrium was established *ab initio* in this position, no untoward vasomotor phenomena occurred, except when adrenalin was injected after induction, a practice now happily abandoned. The method of establishing this equilibrium was essentially matter for discussion by anæsthetists, and he agreed that no one should undertake the administration of chloroform to the sitting patient until he had mastered that method and inquired into its pitfalls.

Mr. DOUGLAS HARMER said that he thought that the importance of the position of the patient for operations on the throat and nose had not received as much attention as it deserved. The subject had been constantly referred to by the late Sir Henry Butlin, who was very emphatic in his opinion that the patient should lie on his right side on a flat table so that the blood could run out of the mouth. For operations in this position the surgeon should sit on a low chair opposite the patient and use a reflected light. An assistant for sponging should stand on the surgeon's right hand, also facing the patient. Under these conditions the work of the anæsthetist was easy, and respiration was never impeded. Both rapid and prolonged operations could be performed with safety. Sudden bleeding, whatever its source, could always be controlled by direct pressure with a sponge. After the pharynx had been freed of blood-clot a spurting vessel could generally be seized with forceps and tied. Such operations should never be done hurriedly. The importance of a skilled anæsthetist and of light anæsthesia was undoubted. Throat operations were rarely dangerous if care was taken

that blood and mucus did not enter the larynx, but one must always be prepared for the unexpected, and ready to do tracheotomy at any moment if the patient could not be made to breathe. As Brünings had pointed out, tracheotomy could often be avoided by assisting the respiration with oxygen. In his opinion the lateral position was better in every way than the upright position. The most dangerous position of all was that in which the head was allowed to hang over the end of the table.

Dr. A. DE PRENDERVILLE said that as he had been referred to by name by Mr. Waggett, he would be glad to bear testimony to the value of the upright position in throat work, and to its safety in trained hands. His own record of this special pose extended over a period of sixteen years, and embraced several thousand cases in all. Sir Frederic Hewitt said that he could see no reason why the upright position should not be used, provided that the anæsthesia was not deep. The speaker begged to endorse that view very strongly. The question, in his opinion, resolved itself into the absence or presence of special training on the part of the administrator. Certain cardinal points must be admitted, and a definite technique observed to obtain safe and good results. Briefly put, the following were essentials: (a) The maintenance of the head and neck in the same plane as the trunk; (b) the gradual, as opposed to the rapid, induction of anæsthesia; (c) the absolute freedom of the air-way; (d) the retention of the corneal reflex; (e) the retention of the cough reflex; (f) the management of the tongue; (g) the proper disposal of the shed blood; (h) the proper angle for the seated patient to assume; (i) the correct support and alignment of the head and nape of neck.

The best angle for the seated patient was one of about 104° . As a support for head and neck, which should rise well above the chair back, rollers made of large bath towels were most useful; they formed soft, easily moulded cushions, taking up less space than pillows, and allowing the anæsthetist to get within easy working distance of his patient. For securing a free breath-way a clip through the tongue tip (*not* the extreme edge) was highly advisable. Standing immediately behind the chair, the anæsthetist controlled and steadied the head, and, with gag in mouth, not only held it firmly in place, but had the middle finger of the same hand free, and lying against the corresponding carotid artery. With regard to bleeding, and the danger signals which foretold loss of cough reflex, a sign of prime import was the diminution, rapid or

gradual, of corneal reflex, together with the concomitant onset of fine or coarse crepitation sounds *with expiration*. Crises like these must be dealt with instantly. The anæsthetist, or preferably the surgeon, must pass a sponge straight back to and down the throat; expulsive efforts to void any obstruction usually followed at once. No attempt to continue the operation should ever be made until both cough and corneal reflexes had been satisfactorily re-established.

The speaker would say, in conclusion, that in his own experience disquieting or alarming symptoms had been singularly rare, and there had been an almost entire absence of long-continued after-effects.

Mr. BARWELL said that the most important point in operations on the upper air-passages was to prevent the entry into the lungs of blood, mucus, or pus. Many years ago he had seen a death from aspiration-pneumonia follow a trivial operation on the nose, and it had made a great impression on his mind. He used the lateral position for nearly all these operations, including septal resections, operations on the antrum, guillotining and enucleation of tonsils, and œsophagoscopy and bronchoscopy. The head could be raised on a pillow, or kept quite low, according to circumstances. Blood collected in the cheek-pool and ran out of the mouth, and there was no risk of its entry into the lungs. Any desired depth of anæsthesia could be maintained. It was in this class of operation that there was most danger during the stage of "coming round." When the nose was obstructed by blood-clot there was a risk of asphyxiation if the tongue fell back; patients who had reached the stage of coughing and brisk reflexes might under these circumstances again become deeply anæsthetic. They should be kept in the lateral position and properly watched.

Mr. E. D. DAVIS said that he wished to support Mr. Waggett in all that he had said with regard to the advantages of the sitting position for anæsthetics in nose and throat cases. He had worked with Mr. Waggett for a good many years and had never seen an unsatisfactory case or a case of heart-failure. On some occasions he had not had a highly skilled anæsthetist, and occasionally the anæsthetic was given by a house physician. He impressed upon the anæsthetist the importance of light anæsthesia, and the commencement of the anæsthetic with the patient in the sitting position. The advantage of the sitting position was the greatly diminished amount of hæmorrhage, and in nasal operations the blood always flowed from the nostrils and practically

none went into the pharynx or œsophagus. The exit of the blood from the nostrils was encouraged by the milking of the nose. He did not agree with the difficulty of hæmorrhage spoken of by Mr. Harmer and Mr. Barwell. Some surgeons were in the habit of using a sponge in the nasopharynx when the patient was lying down, but in his experience the sponge in the nasopharynx increased the accumulation of blood in the nose, requiring a considerable number of swabs, and, in addition, unless the patient was deeply anæsthetized, the sponge was hawked or coughed into the mouth. In conclusion, he wished to emphasize the point that the hæmorrhage was very greatly diminished and the freedom of all respiratory movements was much increased by the sitting posture.

Mr. H. E. G. BOYLE quite agreed with Sir Frederic Hewitt and Mr. Low when they said that they had never seen shock with a patient in the Trendelenburg position: for his own part he preferred the Trendelenburg position for operations on the lower half of the abdomen, and had not so far encountered those difficulties that Dr. McCardie had spoken of. It was absolutely essential to maintain a free air-way, and he believed that the best position for the head was neither flexed nor extended, but that the neck should be in line with the trunk.

Turning to the thorny question of whether the "sitting up" or "the lateral" position was the best for operations in the nose or mouth, he cordially agreed with everything Mr. Harmer had said. He had not had a large experience of the sitting posture, but from what he had seen of it he did not care about it, and preferred to use the lateral position, as he considered it the safest for the patient and certainly not inconvenient for the surgeon. It had been said by other speakers that if the operations were done in the sitting posture the blood went into the œsophagus and was swallowed; surely this could not increase the patient's after-comfort, for one naturally concluded that if the patient swallowed a lot of blood, that blood would almost inevitably be vomited during the stage of recovery or later.

With regard to Dr. McCardie's suggestion that possibly endotracheal ether might be useful in the sitting posture, he could not make any definite statement, but he thought it probable that the method might be useful, and certainly the return stream of air from the trachea ought to prevent blood from entering, but he doubted whether it would prevent blood from getting into the œsophagus.

Mr. HERBERT TILLEY thought that no one position of the patient was pre-eminently safer than another in operations under general anæsthesia for diseases of the nose and throat. That position would probably be the best to which the surgeon and his anæsthetist were accustomed when working together. Personally, he preferred patients lying flat on their back with the head very slightly raised on a small pillow. He thought that anæsthetists did not, as a general rule, sufficiently impress on students the necessity of preserving a free air-way into the lungs; the removal of a small quantity of mucus around the opening into the larynx would often do far more to relieve cyanosis and respiratory difficulties than widely opening the mouth, jerking up the lower jaw, or pulling out the tongue. For a long while he had insisted on his patients being carried back to bed in the lateral position, not from any physiological considerations, but simply because blood oozing from any wounded areas in the upper air passages would escape from the nose or mouth instead of passing into the stomach or lungs, as happened when they were transported from the theatre to their bed in the dorsal position. For similar reasons he insisted that until they had recovered from the anæsthetic they should lie in the left lateral position with the right leg flexed at thigh and knee, but the left leg more extended; during this time no pillow for the head was necessary.

Dr. McCARDIE, in reply, quite agreed with the President, Sir Frederic Hewitt, and others that surgical shock was not seen in the Trendelenburg posture. Of course, a great deal depended on the degree of inclination. Much of the difficulty and danger arose from the acute inclination, which often markedly embarrassed respiration and caused the serious circulatory after-effects mentioned before. Unfortunately, the surgeon at times demanded a degree of inclination incompatible with the best interests of the patient. The fact that shock did not occur in this posture was an argument against the acapnia theory of shock, and tended to show that it was a circulatory phenomenon. Dr. McCardie thought that there were more points against than in favour of the Trendelenburg posture, which was more valuable when shock did occur. Usually it tended to overfill the heart, lungs and brain, and seriously overwork the two former organs. Sir Frederic Hewitt's suggestion as to the transference of patients in the ambulance was a very valuable one and should be worked out practically. The difference between Mr. Waggett's and Mr. Harmer's ideas as to posture in throat operations showed that there was no principle to be stated.

Dr. McCardie preferred the recumbent posture with the pelvis just so much raised as to prevent the inspiration or swallowing of blood and not enough inclined to cause congestion. He was glad to hear that Mr. Boyle thought that intratracheal insufflation in the sitting posture would prevent the inspiration of blood. Mr. Tilley's advocacy of a free air-way was the essential condition. With regard to the use of a mouth-gag, it must be remembered that the jaws opened just like a pair of tongs—i.e., one jaw was fixed while the other moved (i.e., was depressed and moved backwards), with it going the tongue. To correct the backward displacement, when the mouth was widely opened a strong twist forwards should be given to the lower blade of the gag all the time that the mouth was held open. Thus, generally, the jaw and tongue were brought forward enough to allow of free breathing. If this twist were not imparted, intercurrent asphyxia, necessitating the withdrawal of the tongue, might arise.

Section of Anæsthetics.

May 1, 1914.

Dr. J. BLUMFELD, President of the Section, in the Chair.

Sudden Death under Light Chloroform Anæsthesia.

By A. GOODMAN LEVY, M.D.

I HAVE already described on various occasions [1] [2] the effect of small doses of adrenalin upon the mammalian heart under chloroform. When the heart is affected by low concentrations of chloroform it is thrown by the action of adrenalin into a condition known as ventricular fibrillation, but when affected by full concentrations, such, for instance, as a 2 per cent. proportion of vapour to the inhaled air, ventricular fibrillation does not occur. What I have to say to-night is but the logical sequence of this principle.

EXPERIMENTAL OBSERVATIONS ON THE HEART AFFECTED BY CHLOROFORM.

What is ventricular fibrillation? Let me say at once that we have not at present a distinct conception of its intimate nature, but we are aware that ineffectual ventricular contractions succeed one another at a very rapid rate, and the function of the ventricles is entirely abolished; its clinical manifestation is therefore a sudden vascular collapse, and consequent instantaneous death. In the lower mammals fibrillation is generally a permanent condition, but in exceptional cases spontaneous recovery of the heart takes place. In the human subject (judging by the accounts of syncope resulting from the injections of adrenalin under chloroform) recovery from fibrillation is of not infrequent occurrence.

Despite the opinion, expressed some years ago by Professor McWilliam, that it might be found to explain sudden death in some

pathological states, this cardiac condition has been largely regarded in the light of a physiological curiosity only, and I am indebted to Professor Cushny for the original suggestion regarding its possible relation to certain anomalous blood-pressure curves which I had submitted to him.

Let me here draw attention to an analogous condition of the auricles, but only to mark a distinction: fibrillation of the auricles is now a well-recognized clinical entity; it is true it causes a disordered action of the ventricles, but this is entirely of another nature, and fully consistent with the survival of the individual.

Ventricular fibrillation does not occur, under chloroform, in the course of the normal action of the heart; it is invariably preceded by a highly irregular and distinctive ventricular action. The ventricles beat in response to impulses arising in many abnormal foci, none being propagated through the normal channel (that is the auricular ventricular bundles) in sequence to the auricular beat. The succession of these abnormal beats, or extrasystoles, is very rapid; in the cat the rate is from 270 to 330 beats per minute. Although irregular, these extrasystoles are co-ordinate beats, and the blood-pressure is fully maintained during their incidence, and in a manometer tracing this condition is portrayed as a succession of pulse waves which are smaller than the normal, so that to the finger the pulse would feel weak. The waves may be on occasion very evenly spaced, and then the pulse would feel regular, but frequently the tracing is highly irregular, and may be broken by short pauses, and the corresponding pulse waves would then be properly described as "fluttering." This cardiac condition, which is technically known as a multiple ventricular tachycardia, is very commonly observed under low percentages of chloroform; it may persist for a considerable time, ultimately reverting to a regular cardiac rhythm, or it may on occasion, *and on occasion only*, terminate in ventricular fibrillation.

The multiple ventricular tachycardia is a highly developed manifestation of a property which is possessed by chloroform of rendering the ventricles liable to exhibit premature or extrasystolic contractions. These extrasystoles do not always appear in an unbroken sequence: they may be interspaced with normal beats, or they may occur singly and at irregular intervals, or more commonly at rhythmic intervals every second or third beat. When an extrasystole appears every second beat it is termed a bigeminal beat (fig. 1), but it may not be recognized as such by the finger on the pulse, for the extrasystolic

contraction may not be transmitted at all, and then the pulse-rate appears to become halved, or if imperfectly transmitted it may convey the idea of a dicrotic pulse.

Although chloroform renders the ventricles liable to exhibit these abnormal contractions, it does not itself excite them directly, there must be another and distinct *exciting cause*. By taking proper precautions it is possible to induce and maintain chloroform anæsthesia in an animal such as a cat without a single extrasystole making its appearance. The exciting cause of the extrasystole is *some form of cardiac stimulation*.

The effect of a cardiac stimulation naturally varies with its intensity, or may be modified by antagonizing agents (such for instance as exaggerated vagal action), but provided the heart be only lightly affected by chloroform, extrasystoles will almost certainly appear as a

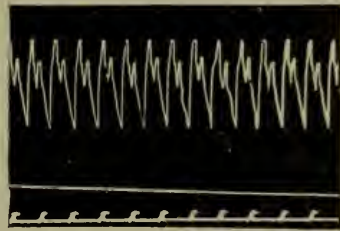


FIG. 1.

Rhythmical extrasystoles occurring under light chloroform anæsthesia. The tall peaks are normal heart-beats; the alternate small peaks represent extrasystoles, and they are followed by a pause indicated in the tracing by a drop in the blood-pressure. The alternating normal and extrasystolic contractions constitute the "bigeminal pulse." Hürtle manometer. Time marked in seconds. (Natural size.)

result, and if they appear in a rapid sequence then they may terminate as ventricular fibrillation. If the heart be more fully affected by chloroform and the stimulation be intense these irregularities may still appear, but they never terminate in ventricular fibrillation; generally even the irregularities are suppressed. The controlling influence of full anæsthetic concentrations of chloroform upon the heart is a fundamental point in the consideration of the cause of death under chloroform; it is, I believe, connected with the depressing influence which chloroform exerts upon the heart, an influence which, as is now well established, is manifested in a progressive fashion as the strength of the vapour is increased.

I will now very briefly describe some of the more important forms of cardiac stimulation which are liable to produce a fatal reaction in the lightly chloroformed animal:—

(1) Stimulation by excitation of the myoneural junctions of the sympathetic cardiac nerves (accelerator nerves), as by adrenalin. This is a very powerful form of stimulation, and almost invariably leads to ventricular fibrillation.

(2) Stimulation of the accelerator nerve-fibres by electrical excitation: this results in ventricular fibrillation in about two-thirds of the experiments, the sequence of events in positive cases being almost precisely similar to that observed in the adrenalin experiment (fig. 2). Not only are the manometer curves identical, but the cardiographic tracings in the two cases are likewise identical, and there can be no

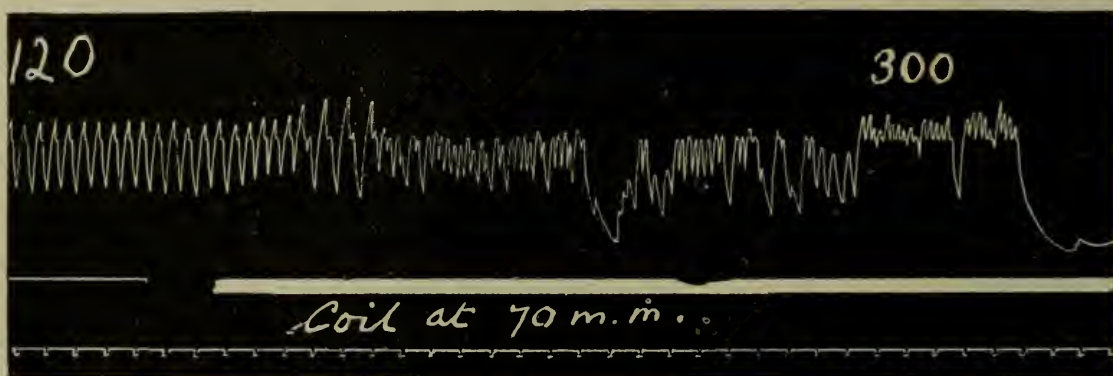


FIG. 2.

Excitation of the cardiac accelerator nerves with a faradic current, in a cat under 0·5 per cent. chloroform. The heart-beat becomes highly irregular and interrupted by short pauses, and finally fails abruptly and permanently in ventricular fibrillation. The figures above the curve indicate rates of heart-beat. The signal mark indicates the duration of the faradic excitation. Hürtle manometer. Time marked in seconds. (Natural size.)

possible doubt that an identical process is involved in each of these reactions.

(3) Stimulation by accelerator impulses originating in the central nervous system, such as may accompany the subconscious emotional state of a struggling animal. This is a very usual precursor of ventricular irregularities, and occasionally of ventricular fibrillation (fig. 3).

(4) Stimulation by accelerator impulses originating as a *reflex* from the excitation of sensory nerves. Experimentally, irregularities are very

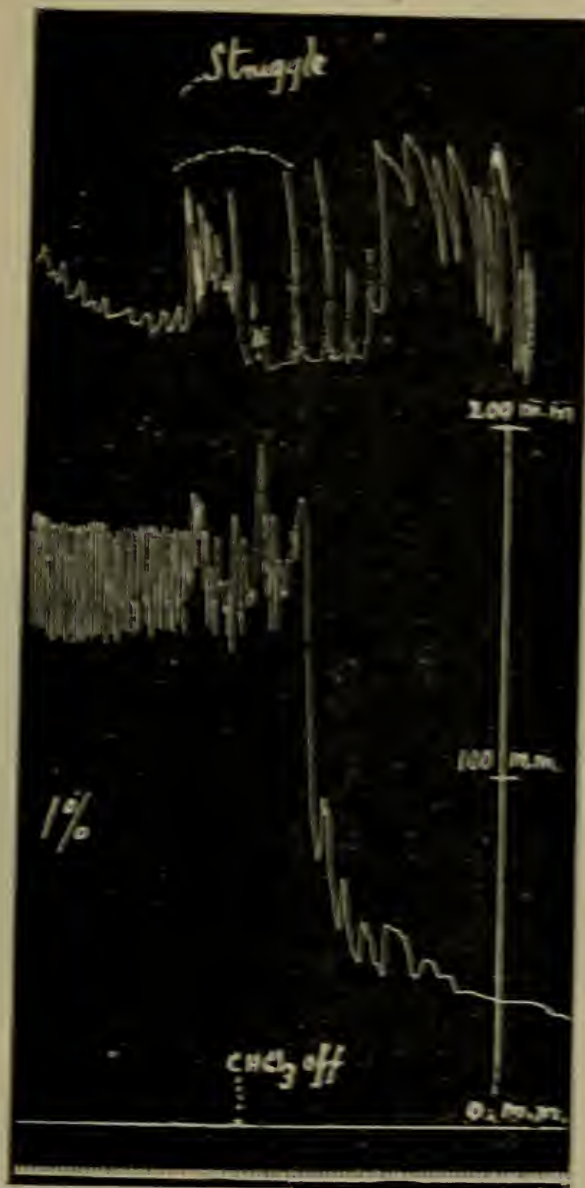


FIG. 3.

Ventricular fibrillation caused by struggling during the induction period. Upper curve respiratory. This shows a declination in its first portion caused by a leak in the recording apparatus. Lower curve blood-pressure, registered by a mercury manometer. Time marked in seconds. Anaesthesia induced by 1.5 per cent. chloroform, then 2 per cent., then reversion to 1 per cent. when the animal began to struggle. The heart became very irregular, the chloroform was entirely removed, and the ventricles fibrillated a few seconds later. The fluctuations in the blood-pressure during struggling are mainly mechanical, and the small irregular beats are almost obscured in the reproduction; ventricular fibrillation is indicated by the abrupt fall of blood-pressure. The final fluctuations at the foot of the pressure curve are caused by the powerful asphyxial respiratory gasps, which are delineated in the respiration curve. The heart was inspected immediately on the cessation of respiration, and the ventricles were found in a state of coarse fibrillation. ($\times \frac{1}{4}$.)

readily induced by comparatively mild forms of sensory excitation, such as cutting the skin, or more certainly by cutting or applying a faradic current to nerve trunks containing sensory fibres. As a relatively rare event, ventricular fibrillation is a sequence.

(5) Stimulation by release from depressing or restraining influences, or "passive stimulation." This is well exemplified by the result of section of the vagi; the heart becomes highly irregular, and not infrequently the ventricles ultimately fibrillate. Entirely analogous to this is the result of reducing the strength of the chloroform, or removing it altogether; the heart responds by gathering force and frequency of contraction, and in consequence it very usually becomes irregular; if it becomes highly irregular sudden syncope from ventricular fibrillation

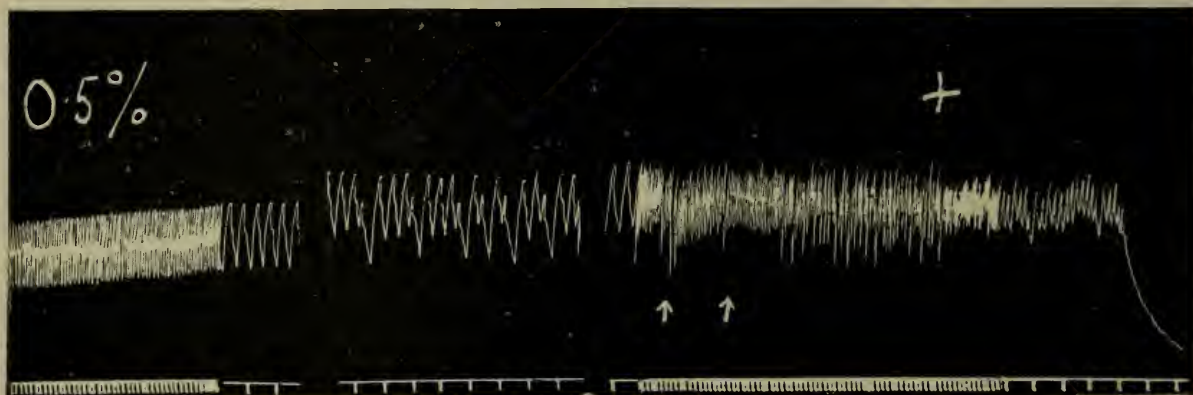


FIG. 4.

The effect of abruptly reducing the strength of chloroform vapour from 2 per cent. to 0.5 per cent. Portions of the tracing have been cut out in order to reduce its length; the first interval represents a period of 115 seconds, the second interval a period of 35 seconds. The time-marker indicates seconds; the spacing of the time marks differs accordingly as the paper was moving at a quick or slow rate. At the beginning of the tracing the vapour was reduced, the heart-beat then being regular, blood-pressure = 84 mm. Hg. In the middle section the blood-pressure has risen to 114 mm.; extrasystoles now appear at irregular intervals. In the third section no chloroform was inhaled for the short space indicated between the arrows. At the mark + the irregularities assume a more intense form, that of a multiple tachycardia, and a little later the ventricles pass into fibrillation and the blood-pressure falls to zero in consequence. Hürtle manometer. (Natural size.)

may be observed, sometimes attained with startling rapidity, but fortunately this climax is an exceptional event (fig. 4). This effect may be observed in the earliest stages of the administration, but it has been frequently observed also in cats after removing the chloroform on the completion of an operation, particularly when excitement occurs on

recovery, occasionally when the animal is perfectly quiescent. The animal is particularly liable to die in this way after a short administration, or after a more prolonged operation under restricted doses of chloroform; it may then occur within a minute or two or may be deferred so long as fifteen minutes.

(6) Stimulation by re-application of the vapour after an intermission, or in the course of a very light administration.

The source of the cardiac stimulation affected in this way is complex. In the first place, a sensori-sympathic reflex originates as a result of the pungency of the chloroform vapour, and it is noteworthy that the

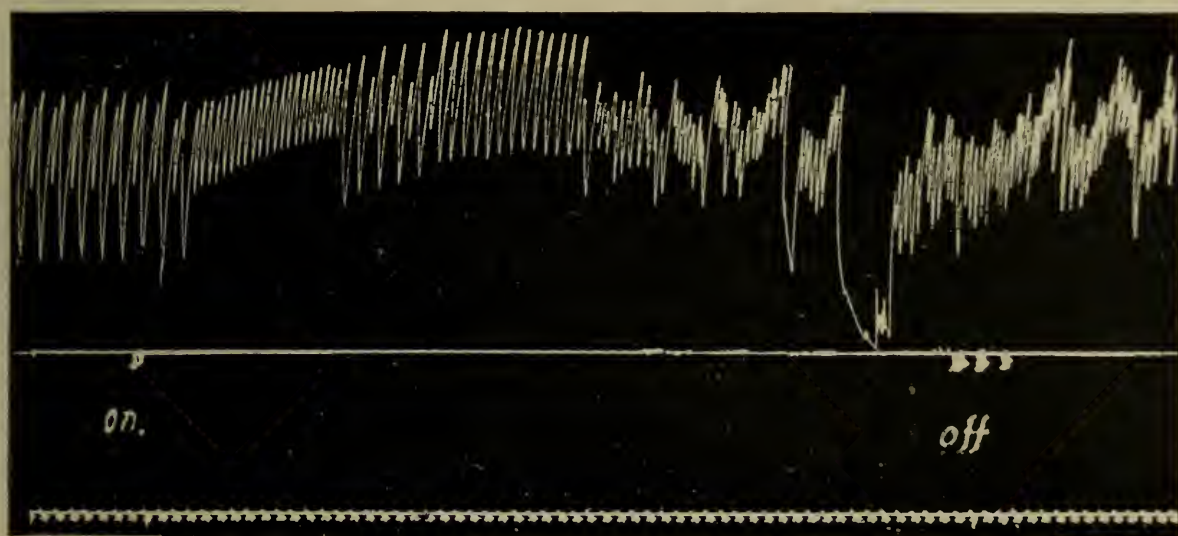


FIG. 5.

The effect of suddenly administering strong chloroform vapour to a cat which was under the influence of chloroform but not inhaling any at the moment of re-application; 5 mg. of atropine sulphate had been injected in the earlier stages of the experiment. The heart is at first beating in "trigeminæ"—i.e., every third beat is an extrasystole; the irregular beat is not transmitted, and is identified by its following pause and consequent fall of blood-pressure. On re-applying the chloroform (at the first signal mark) the blood-pressure rises considerably. In twenty-five seconds the beat becomes rapid and very irregular, and finally the ventricles fibrillate for a period of about four seconds, when recovery ensues. Time marked in seconds. Hürtle manometer. ($\times \frac{3}{2}$.)

stronger vapours are the more active when employed in this connexion, although ordinary anæsthetic strengths such as 2 per cent. or under may produce a like result. In a normal animal, so far as I have observed, ventricular fibrillation is a sequence of re-application only when it is performed in the course of an already existing irregular tachycardia induced from some other cause, such as struggling or a

reduced strength of vapour; otherwise evidence of a sympathetic reflex is best demonstrated in animals under the influence of sufficient atropine to a co-existent counteract vagal reflex. In fig. 5 it is seen that the first effect of re-application is a rise of blood-pressure due to a reflex vaso-constrictor action, and this is coupled doubtless with a reflex sympathetic stimulation of both the heart and suprarenal glands (*vide infra*). In part, but in part only, the vaso-constriction must be attributed to the initial stimulant action of chloroform upon the nerve centres, an action which was demonstrated by Gaskell and Shore, and an additional interest is attached to their observations in that they serve to illustrate that the initial effect of chloroform, before it becomes depressant, is that of a protoplasmic stimulant.¹ This initial stimulant action of chloroform is not confined to the nerve centres, it is likewise exerted directly upon the heart muscle, and constitutes an additional source of cardiac stimulation. This triple attack upon the lightly chloroformed heart (through accelerator action, increased adrenal secretion, and direct stimulation) may result in syncope from ventricular fibrillation before the chloroform has acted sufficiently long to depress the ventricles, and death may result within a few seconds of re-application or sometimes almost instantaneously thereafter.

There is a highly interesting adjuvant source of stimulation arising in the course of emotional disturbances and of sensory excitations. Recent researches have thrown new light upon the secretion of adrenalin in response to nervous impulses. The suprarenal bodies receive their innervation through the sympathetic system, and it has been demonstrated that in emotional states adrenalin is present in increased quantities in the blood, and that the secretion of adrenalin is increased likewise as a sensory reflex. I have shown by experiment that the reflex secretion of adrenalin alone may on occasion even be sufficient to set the ventricles in fibrillation, but the purely nervous mechanism—i.e., stimulation of the heart through the accelerator nerves—is by itself perfectly efficient to produce fibrillation, and the adrenalin factor, when it occurs, must be regarded generally as in the light of an accessory action.

These observations may be summarized—thus: Death from ventricular fibrillation under chloroform may be observed under any of the following and applied clinical conditions:—

¹ Hamburger's recent researches in connexion with phagocytosis incidentally afford a striking corroboration of this property of chloroform.

(A) During the induction and early stages of the administration of chloroform, and exceptionally later in the administration: (i) during struggles and excitement; (ii) on removal of the chloroform; (iii) on abrupt re-administration of chloroform after removal, or its sudden increase during a period of very light anæsthesia; (iv) by any combination of these occurrences.

(B) During operation. By strong sensory stimuli under light anæsthesia.

(C) After operation. On removal of the chloroform, specially after a short operation.

As regards ether. I have never observed death by ventricular fibrillation in cats under ether through any of the procedures indicated above; even very large doses of adrenalin have failed to produce this effect. Ether, however, is in no way *protective* against ventricular fibrillation, and there is no reason to believe that anæsthetic mixtures of ether and chloroform or indeed of any mixture containing chloroform are in any way exempt from the fatalities connected with the administration of pure chloroform.

THE CLINICAL MANIFESTATIONS OF VENTRICULAR FIBRILLATION.

The respiratory phenomena following ventricular fibrillation are simple and distinctive. The respiratory centre is at first excited by the sudden anæmia, and subsequently fails from the same cause; a few exaggerated respirations therefore follow the sudden cardiac syncope, and then the breathing ceases entirely. There is a persistent tendency towards recovery of the respiration, often continuing long after the heart has ceased to beat, and should the latter recover the breathing is immediately resumed. A secondary cardiac syncope, with its attendant gaping respiration, may supervene on a temporary recovery, and thus there arises occasionally some confusion in the clinical interpretations of the true order of events. Sudden anæmia likewise excites the spinal motor nerve centres of the skeletal muscles; some evidence of muscular convulsions is therefore generally observed, and in very lightly anæsthetized subjects these may be a pronounced feature of death by ventricular fibrillation; the "epileptiform fit," which has been in some cases described as preceding death, is probably an asphyxial convulsion succeeding syncope.

There is one symptom which may be observed in man and which cannot be observed in the cat, and that is sudden and intense pallor;

this is associated with another striking symptom—i.e., sudden and extreme dilatation of the pupils. The performance of artificial respiration may restore a pink tinge of colour to the face by setting up a slight mechanical circulation, but this is of course deceptive as regards the function of the heart, which is still entirely in abeyance.

THE CONDITIONS OF ANÆSTHESIA WHICH PRECEDE DEATH IN THE HUMAN SUBJECT.

I have now given you a fairly complete account of death from ventricular fibrillation; it is a condensed account, but I trust a sufficiently clear one. The question now arises, what proportion of deaths occurring in the human subject may be attributed to ventricular fibrillation?

An essential part of my theory is the fact that deaths by ventricular fibrillation occur only in the lightly anæsthetized subject, and it hence stands in clear contrast with the accepted explanation of death under chloroform—i.e., by over-dosage. The symptoms of over-dosage are familiar: The respirations and the pulse become progressively more feeble; the respiratory functions are generally the first to fail, and according to some authorities invariably the first. A form of death is likewise described by Embley limited to the period of the induction of anæsthesia, the heart being suddenly arrested by vagal impulses arising in the medulla as a result of the direct action of chloroform; this, likewise, is an over-dose effect, and is only produced in normal—i.e., non-morphinized—animals by the persistent administration of a very strong vapour.

The subject of death by over-dosage is long, complicated, and not fully investigated; let it suffice for the moment to admit that the over-dosed subject, with circulation and respiration strongly depressed, may be in a critical condition.

These two rival theories, under-dose *v.* over-dose, may be fairly submitted to the arbitration of clinical experience, and this test I shall now proceed to apply in the form of a collection of reports of fatalities under chloroform. In considering these reports I would ask you to bear in mind that a patient cannot be made to pass, even by extreme measures, from a state of light anæsthesia into one of profound narcosis or over-dose in a few seconds; in effect, a patient cannot be struggling at one moment and profoundly anæsthetized the next.

I would also ask you to consider the following point: A certain quantity of chloroform must be employed, and a certain dose proportionate to the body-mass must be introduced into the body, in order to produce symptoms of over-dosage. The importance of regulating the strength of vapour has been so strongly insisted upon that one is likely to lose sight of the above fact. Snow calculated that 38 minims of chloroform retained in the body of an average adult would cause cessation of the respiration, but Snow only took the fluids of the body into account, and did not consider absorption by the solid tissues; further, his *data* regarding the solubility of chloroform in blood, as we now know, were not precise. Snow's estimate is at the present time considered too low, and it is probable that about twice the quantity—i.e., 76 minims—would be a more correct calculation. When chloroform is inhaled from an open mask not more than half of it passes into the lungs as vapour, the remainder being dissipated into the air, and of the portion inhaled not more than half passes into the blood, the remainder being exhaled, so that we may say that about one-quarter of the chloroform put on an open mask may be absorbed, provided the conditions are such as entail a fairly rapid rate of evaporation. In the case of a closed inhaler the whole of the vapour is inhaled, and possibly half the chloroform put into it may be absorbed under similar conditions. We may take it, therefore, that not less than 2 dr. of chloroform in an inhaler, or 4 dr. in an open mask, administered in a full concentration, are essential to produce respiratory failure in an average adult. In many of the following cases the amount of chloroform employed was evidently carefully measured, and details such as these afford assistance in forming a judgment regarding the degree of narcosis involved. All cases in which not more than 1 dr. was used by open method or inhaler, have therefore been excluded from the category of death from over-dosage.

The collection of cases which I shall submit to analysis is that found in the Report of the Anæsthetics Committee of the Royal Medical and Chirurgical Society, and issued in 1864.¹ In this report 109 cases of fatalities are briefly summarized and commented upon. In many cases, but not in all, the original references are available, and from these I have in several instances obtained important supplementary information. I have found it necessary to exclude 11 of these cases as they are absolutely lacking in detail; the numerical references to these excluded cases are given in the appended table, as are likewise

¹ *Med.-Chir. Trans.* 1864, xlvii, pp. 323-442.

those of all the remaining cases, under separate headings. Thus there remain 98 cases to be dealt with, and the percentages mentioned are expressions of a proportion to this total of 98. No less than 47 (or 48 per cent.) are described by the Committee as lightly anæsthetized at the time of death; the terms employed are "incomplete anæsthesia," "commencing to inhale," "stage of excitement," "not fully under," &c., and in one case "under the influence of chloroform." I give the reference numbers of these cases, but they require no further comment, they speak for themselves. The remaining cases are for the most part described as fully under, or else no specific comment is made. In 14 of these cases I find definite evidence that the patients were only lightly anæsthetized at the moment of death, and I have inserted in the table very brief abstracts of these reports in support of my contention. Thus in 62 per cent. of the cases it is demonstrated that the patients died under light anæsthesia. In 24 other cases, although no definite symptoms of light anæsthesia are described, it is possible to exclude over-dose as a cause of death. These cases are likewise briefly abstracted; it will be noted that in the majority of instances the chloroform had been entirely removed when death occurred, and there can be no stronger reason than this for excluding the possibility of death from over-dosage. It thus appears that in 87 per cent. of the cases death was not caused by an over-dose. In six other cases the evidence is not so definite, but I consider that death by over-dose is improbable; I cannot support this contention in a brief abstract, for the original reports must be carefully considered. Thus in 92 per cent. death by over-dose could either be excluded or was improbable. I do not venture to express an opinion upon the details available of the remaining seven cases. There is a strong suspicion of under-dosage in several, in some of the others there appears to be a possibility of death from over-dosage, *but in not a single instance out of the whole 98 cases is there any definite evidence that the patient died from over-dosage.*

You cannot, I am sure, fail to be impressed with the fact that some 87 per cent. of deaths are not caused by over-dosage, and therefore can be accounted for by no other theory than that of fibrillation of the ventricles; I believe the actual facts are even more impressive than this, and that of the remaining 13 per cent. a large majority must be included in the same category; a few of them may be due to accidental causes, but there is little or no direct clinical evidence to show that any deaths are due to over-dosage.

THE MODE OF DEATH IN CHLOROFORM SYNCOPE.

We may now consider the mode of death in these cases. It will perhaps carry more conviction to your minds if I quote the words of Snow, in commenting upon a number of cases collected by himself, all of which are included in this report. He says:¹ "In all cases in which the symptoms which occurred at the time of death are reported, there is every reason to conclude, as shown above, that death took place by cardiac syncope, or arrest of the action of the heart. In forty of these cases the symptoms of danger appeared to rise entirely from cardiac syncope, and were not complicated by the over-action of the chloroform on the brain. It was only in four cases that the breathing appeared to be embarrassed and arrested by the effect of the chloroform on the brain and medulla oblongata, at the time when the action of the heart was arrested by it, and only in one of these cases (No. 42²) that the breathing was distinctly arrested by the effect of the chloroform, a few seconds before that agent also arrested the action of the heart."

These are Snow's words. The theoretical conclusions he arrives at are not material to the question under consideration; I have dealt with them elsewhere, but I would point out that the remaining cases in the list might be summarized in almost precisely similar words, for death is clearly described in the great majority of cases as occurring by primary cardiac syncope. This mode of death conforms with my theory of death by ventricular fibrillation, and all the clinical symptoms and manifestations of this form of syncope are very fully illustrated in many of the reports. Furthermore, you will find in these reports ample illustration of the various modes of the production of ventricular fibrillation which I have described as occurring in animals. It is to the original reports themselves that I must refer you for confirmation of this statement, for I have been unable to emphasize these points in my brief tabular summary of the cases.

¹ Snow "On Anæsthetics," 1858, p. 217.

² No. 50 in Royal Medical and Chirurgical Society's list.

PRACTICAL CONSIDERATIONS.

It must now be admitted in view of the foregoing experimental and clinical evidence that the subject of light chloroform anæsthesia requires very serious attention, and that appropriate precautions should be adopted. Fortunately these are very simple; the first principles are to keep the patient *fully anæsthetized* and to make the *administration continuous*. I do not in any way advocate an excessive administration, for profound narcosis is uncalled for except by the exigencies of some special operations only; it can and should be avoided.

In the induction stage the administration should not only be continuous but should also be progressive; the strength of vapour should be increased as rapidly as is possible without distressing the patient, for it is well to bring the patient under the full influence of chloroform as quickly as is practicable. Sufficient vapour should always be available; to speak in percentage terms,¹ a vapour of 3·5 to 4 per cent. strength may be required for exceptional and insusceptible cases, for such insusceptible cases always present elements of danger from imperfect anæsthesia. In my opinion and experience a 4 per cent. vapour strength may be used with impunity when attained in progressive stages, but it should not be used for long, and it should not be used unless necessary. For some cases a 2 per cent. vapour is sufficient, but these cases are in a minority [6]. Should the patient become excited or struggle during the induction, the administration should never, on any account, be remitted, as is at present the practice and teaching.

There is one practical detail which I believe is important, and that is to keep the patient entirely undisturbed until fully under the anæsthetic. It is too frequent a practice to attempt to save time by scrubbing or shaving the skin during the period of induction; this may produce excitement, and, therefore, even the bandages should be left undisturbed until consciousness is absolutely abolished.

The skin incision and the earliest stages of the operation should be performed under a full degree of anæsthesia, with the pupils slightly dilated and with a faint corneal reflex only. The strength of the vapour may be diminished as the operation proceeds, for a lower per-

¹ These percentage terms will be more readily appreciated by those who have employed percentage inhalers. I may add that it is difficult to obtain so much as 4 per cent. of vapour from an ordinary "open" mask—i.e., a mask which is not in contact with the face.

centage suffices to maintain a sufficient depth of narcosis, but all severe operative procedures should be anticipated by a more liberal administration.

These new facts which I have presented almost appear to reopen the old and oft debated question—whether to watch the pulse or the respiration. There can be no doubt that both pulse and respiration should receive attention, and the respiration the greater share. No process of inhalation can be successful without a properly maintained respiratory process, and further, weakening of the respirations remains the most important sign of impending excessive dosage. The pulse should unquestionably be kept under observation likewise, for any of the abnormalities of the heart-beat to which I have already referred may provide danger signals of important significance; at the same time you cannot rely on the pulse as a guide to under-dosage, as you can on the respiration as a guide to over-dosage; for an irregular pulse may be followed by ventricular fibrillation with startling rapidity, and the time all too short to adopt remedial measures.

I feel constrained to touch upon a certain condition which is not uncommon and which is dangerous. The patient is not over-dosed, a fair corneal reflex is present, the pupils are somewhat dilated, the skin pale and sweating; the pulse is rapid and small. This condition is the result of sympathetic reflexes from sensory stimuli; it is generally regarded as one of shock, but it is not so in the proper sense of the word, for the blood-pressure may be well sustained. Should the anæsthetic be remitted during this condition a disaster might very well occur; the interests of the patient would be best considered by stopping the operation for a little while and putting him more deeply under the anæsthetic before proceeding further.

Narcosis should be properly maintained up to the last stages of the operation; and after short operations even during the final bandaging. Never try to rouse the patient, but when everything is completed get him put back to bed with as little disturbance as possible. For short operations chloroform should be very fully administered, for cardiac syncope may occur during the rapid recovery which follows a brief and light administration of chloroform. In the case of children the danger is probably less, for they do not appear to be so subject to this form of syncope as are adults, but it is well even in their case to ensure very full anæsthesia before discontinuing the administration.

To attain a continuous administration a methodical procedure is obviously desirable; probably the nature of the method is not so

important as the employment of *some* method, whether by inhaler or otherwise. Every expert anæsthetist has doubtless by dint of experience developed his own method, but the uninitiated may find some hints on methodical procedure with the simplest appliances in a former paper which I have published appertaining to the physical conditions of the evaporation of chloroform [5]. I have found it possible not only to develop methods with simple appliances, but what is more important, to make them teachable to students.

It is not every error of administration that is penalized by death of the patient, as you will have gathered from my experiments on animals, and it is a fortunate circumstance that men are not so liable to ventricular fibrillation as are cats; but a repetition of errors of the kind I have mentioned in detail will inevitably exact its toll of fatalities.

I have entered into the particulars in some detail; they are perhaps a counsel of perfection, for the essential points are merely *full and continuous anæsthesia*. The first of these points was insisted on by Syme in the old Edinburgh days and practised with undoubted success; the second is no less important. There is no doubt that under Syme's instructions his patients were fully anæsthetized, and according to Lister he never had a death from chloroform to the end of his career. This fact not only supports my views in regard to the danger of light anæsthesia, but it likewise confirms my contention that there is very little if any real danger of death by over-dosage in the hands of fairly competent administrators, and it must be remembered in this connexion that Syme's anæsthetics were given by his house surgeons, and not by specially trained anæsthetists; in fact, although some degree of over-dosage is a common enough event in practice, I do not think any qualified anæsthetist is likely to push the process to such an extreme degree that the vital functions become extinguished beyond all hope of resuscitation.

It is now obvious that the present-day teaching, that safety lies in the attenuation of vapour percentages, must be permanently abandoned, but there is no reason for a violent reaction, leading to the adoption of the extreme opposite practice. Excessive dosage is of course undesirable in every way, apart from the immediate question of danger to life, and it may be avoided most readily by the same practice which I have already advocated as tending in part to avoid death by ventricular fibrillation—i.e., by a methodically controlled and continuous administration of vapour; in other words, by maintaining a steady level of anæsthesia, so far as the exigencies of the operation will allow.

What are the proper methods of resuscitation to adopt when ventricular fibrillation is established? The only remedy I have to suggest is massage of the ventricles. It is not advisable to attempt this at once, for the heart may recover spontaneously; two minutes' grace is all I would advise. During this interval I would continue to keep the lungs well charged with vapour by artificial respiration in anticipation of a tendency to relapse after recovery. At the end of two minutes, if there is still no indication of cardiac action, open the abdomen, and with the hand compress the ventricles between the diaphragm and the chest forcibly and rhythmically. Artificial respiration should be maintained meanwhile, so that the heart may not die from asphyxia, for a measure of circulation is maintained by the cardiac compression. Undoubtedly direct digital compression of the ventricles would be the best measure to adopt to restore the heart's functions; it is generally successful in animals after a time, but it could only be attempted in the human subject if proper means were available for insufflating the lungs after opening the thorax; whether such an extreme measure would result in permanent recovery of the human patient can only be told from actual experience.

I may here introduce a few words regarding the much discussed relation of asphyxia to sudden death. I investigated this subject experimentally some time ago, and was then quite unable to confirm any relationship, short of complete suffocation [7]. I did, however, describe an irregular action of the heart which is frequently noted in asphyxia under chloroform; these asphyxial irregularities are identical with the chloroform irregularities described in this paper, and at least one source of cardiac excitation has been demonstrated to arise as the result of asphyxia—viz., an increased output of adrenalin. The action of asphyxia is, however, complex, for cardiac anoxæmia is a condition which very distinctly protects against ventricular fibrillation by depressing the heart, very much as full chloroform anæsthesia does; but the irregularities induced by asphyxia under light chloroform anæsthesia may, as an exceedingly rare event, proceed to actual fibrillation, as I have indeed now observed in a single and non-fatal instance. Danger is more likely to arise in practice if the chloroform be withdrawn after the airway has been cleared, and the patient is recovering from profound asphyxia. That the danger of asphyxia under chloroform has been greatly exaggerated is evident from a consideration of the Medico-Chirurgical Report, for in four cases only is there any reference to a dusky complexion preceding death; in each case there was other

sufficient reason for death occurring, and it is an open question, on clinical evidence alone, whether the asphyxia had any relation in this respect.

A word of warning in regard to the use of atropine. This throws the vagi out of action, and no doubt favours ventricular fibrillation under light anæsthesia; in fact, it will frequently cause death under such conditions when injected into a vein in animals. When very deep anæsthesia is required it is probable that atropine sustains the heart's action, and it should only be employed under such circumstances, otherwise I regard its use as inadvisable.

As a final point of clinical interest I may tell you that the drugs known as epinine and tyramine act precisely like adrenalin, but I cannot find any definite objection to the use of pituitary extract for the treatment of shock under chloroform; this substance is a cardiac stimulant to a slight degree, and should, therefore, be used with some caution, but I have not succeeded in causing death in cats by its agency.

In conclusion, I may quote the statistics of the Registrar-General's Reports to reinforce my position. The number of deaths under chloroform and mixtures containing chloroform vary from 83 to 90 per cent. of the annual total of deaths under anæsthetics, and the latter may therefore be taken as a rough measure of the deaths under chloroform.¹ In 1900 the recorded deaths under chloroform were 116, and they have been increasing ever since until in 1910 they doubled their number, reaching a total of 234. In 1911 a more accurate method of registration was adopted, and the total rose to 276. No doubt the increase is partly accounted for by the increase in the number of operations performed in recent years, but on the other hand, it should be borne in mind that there has been a great tendency to displace chloroform by other anæsthetics, and at least it is abundantly evident that the insistent teaching of recent years, tending to the extreme attenuation of chloroform vapour, has done nothing to reduce the number of fatalities; in my opinion it has been largely responsible for their perpetuation and increase.

I put my views forward in entire confidence that they are the correct views to adopt, and that they will prove of substantial benefit to humanity. Nevertheless I recognize that they may be modified as the result of clinical observation, and I venture to trust, that bearing this in mind, every administrator of anæsthetics who may observe a

¹ It is not possible to calculate the exact percentage in any one year owing to a lack of sufficient details.

death under chloroform will adopt some means of putting the fullest possible report of it on record.

It has been possible, within the scope of this paper, to present the subject in brief outline only; my researches into the cause of sudden death under chloroform have formed the subject of a number of papers [2], [3], [4]), and I must refer you to these for the more precise experimental details, and equally for a reference to the names of the many investigators whose works have contributed an important share in the solution of this complex problem.

ANALYSIS OF 109 CASES OF DEATHS UNDER CHLOROFORM, COLLECTED BY THE CHLOROFORM COMMITTEE OF THE ROYAL MEDICAL AND CHIRURGICAL SOCIETY, PUBLISHED IN 1864.

Cases excluded on account of a complete lack of detail	Total 11 ...	Nos. 6, 9, 15, 23, 60, 65, 67, 77, 89, 91, 109.
Cases described by the Committee as not fully anæsthetized	Total 47 ...	Nos. 1, 3, 4, 5, 7, 8, 11, 13, 16, 17, 20, 22, 24, 28, 30, 33, 34, 38, 40, 45, 46, 49, 52, 53, 54, 55, 56, 59, 61, 62, 63, 66, 69, 72, 73, 74, 83, 84, 90, 92, 93, 100, 101, 102, 103, 107, 108.
Cases showing definite evidence of light anæsthesia, but not so described by the Committee		No. 2. Inhalation one minute only; chloroform removed during the operation (teeth extraction); groaned during the operation. „ 14. Chloroform removed, toe-nail evulsed, struggled for one minute, and then died; about $\frac{1}{2}$ dr. of chloroform in an inhaler. „ 19. The towel was removed, but the patient not being insensible it was again applied; after a few inspirations the pulse ceased and the patient died. „ 29. “To prevent his becoming altogether sensible I commenced to give him a little more chloroform; he had only taken two or three inspirations when his breathing ceased” (Snow, “On Anæsthetics,” p. 208). „ 32. “Insensibility was not complete, for after the incision was made the man more than once said a cat was scratching him” (<i>Lancet</i>, 1853. i, p. 21). „ 37. The chloroform was removed whilst patient was still violent; having quieted down he was pulled into position and the perineum shaved; he died suddenly without having had any more chloroform. „ 58. As soon as the patient became unconscious the inhaler was removed, and acid applied to some warts; she moved her legs as though recovering from the anæsthetic, and died a few minutes later; 1 dr. of chloroform in the inhaler.

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ANALYSIS OF 109 CASES OF DEATHS UNDER CHLOROFORM—(continued).

Cases showing definite evidence of light anæsthesia, but not so described by the Committee—(continued)	...	...	No. 78. Chloroform given to allay maniacal excitement; "great excitement and struggling."
			„ 81. Operation ended, chloroform removed; a moan was heard; patient died.
			„ 87. Chloroform reapplied; stertor appeared whilst struggling continued; sponge at once withdrawn; in another minute full stertor came on; pulse ceased; respiration continued for some time.
			„ 95. "He suddenly raised himself in bed, and the breathing ceased."
			„ 96. Operation commenced, patient slightly conscious; another drachm of chloroform was applied, patient took one inspiration, and pulse stopped.
			„ 99. The patient moved his limb slightly and more chloroform was applied, when he suddenly became deathly pale and his pulse ceased.
Total 14	...	„	106. Seated in a chair; in three or four minutes "the spasms which precede the loss of sensibility set in," when the pupils suddenly dilated, and no pulse could be felt.
Cases in which over-dosage can be excluded			No. 18. Death occurred suddenly after the administration was discontinued; 1 dr. of chloroform on a handkerchief.
		„	25. Induction with 70 minims of CHCl_3 in about seven minutes; insensibility being established the further administration of chloroform was desisted from; the respirations were then unembarrassed, the pulse regular and about 70, the lips florid; the scrotum was then incised, blood flowed freely at first but almost instantaneously ceased; the pulse ceased at the same moment.
		„	26. Chloroform removed, pupil contracted, conjunctiva slightly red; operation performed without further chloroform; at end patient found to be dead.
		„	31. Caustic applied when insufficiently insensible, a little more chloroform given; caustic again applied without further chloroform; death on completion of application of caustic.
		„	35. Trismus preceded cardiac failure; death after less than five minutes' inhalation.
		„	36. 1 dr. of CHCl_3 inhaled from a sponge held over the nostrils, the mouth being left free; the patient died on the first incision after inhaling in this way for four minutes only.
		„	39. The inhaler was removed and patient drawn into (lithotomy?) position when the pulse was noted to be weak and fluttering, the pupils of medium size; the respirations gradually ceased.

ANALYSIS OF 109 CASES OF DEATHS UNDER CHLOROFORM—(continued).

- Cases in which over-dosage can be excluded — (continued)
- ... No. 41. Operation for lipoma of the back, patient sitting up; 1 dr. of CHCl_3 given; the patient fell forward on the incisions being made and was found to be dead.
- „ 42. 1 dr. of CHCl_3 inhaled from a sponge for five minutes; a second drachm was then added, when pulse stopped almost immediately after; the pupils were not dilated before death.
- „ 43. “Symptoms of anæsthesia” were obtained after two minutes’ inhalation with considerable struggling; patient then drawn to the side of the bed and an assistant directed to put “several drops of chloroform on the compress”; pulse ceased suddenly on performing a short operation; breathing continued; the compress had been removed several seconds before the pulse failed.
- „ 44. Chloroform administered with “more than usual precaution”; forty minutes taken to induce “conclusive signs of the satisfactory action of the chloroform”; the pulse stopped suddenly just before the operation was commenced.
- „ 47. Pulse failed suddenly on reduction of dislocation; the respirations continued; during a temporary recovery of the heart the patient extended his arms, and appeared to reply to questions; secondary collapse then occurred and death.
- „ 51. Duration of inhalation about three minutes, “insensibility just fully established,” when the pulse failed suddenly; 2 dr. of chloroform on lint.
- „ 57. Patient partially recovered after two minutes without chloroform; another half a drachm poured on lint and applied to the nostrils, which was said to produce full anæsthesia; respirations well sustained; pulse frequent and feeble; chloroform again taken away, after which pulse ceased, and respirations shortly after; operation not begun.
- „ 68. After operation; chloroform had been removed; pulse and respiration regular; pulse stopped suddenly a little later.
- „ 71. Inhaler removed, and then incision made; pulse fluttered and ceased; $1\frac{1}{2}$ dr. of chloroform in inhaler.
- „ 75. Dislocation reduced; chloroform removed; face became congested; respiration failed and stopped; no pulse.
- „ 80. Chloroform wholly suspended “when excitement subsided”; orbicular reacted distinctly though sluggishly; pulse full and regular death whilst arranging patient in position.

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ANALYSIS OF 109 CASES OF DEATHS UNDER CHLOROFORM—(continued).

Cases in which over-dosage can be excluded — (continued)	...	...	No. 82. 1 dr. of chloroform in inhaler; death on commencing operation.
			„ 85. Sudden syncope two minutes after removing the chloroform, whilst introducing a catheter.
			„ 88. Sudden pallor and death at least two minutes after removing the inhaler.
			„ 94. Administration stopped after four minutes' inhalation, pulse ceased twenty seconds later, respiration continued.
			„ 97. 1½ dr. of chloroform administered “with great precaution” in an inhaler; death twenty minutes from commencement; operation completed.
	Total 24	...	„ 105. Operation for fistula begun and completed after cessation of administration; breathing ceased three minutes later.
Cases in which over-dose was improbable	Total 6	...	Nos. 10, 21, 27, 48, 64, 104.
Cases in which no opinion can be expressed as to the depth of anæsthesia	Total 7	...	Nos. 12, 50, 70, 76, 79, 86, 98.

Grand Total 109

REFERENCES.

- [1] LEVY, A. GOODMAN. *Brit. Med. Journ.*, 1912, ii, p. 627.
- [2] *Idem* (with Dr. T. LEWIS). *Heart*, 1911-12, iii, p. 99.
- [3] LEVY, A. GOODMAN. *Heart*, 1913, iv, p. 319.
- [4] *Idem*. *Ibid.*, 1914, v, p. 330.
- [5] *Idem*. *Brit. Med. Journ.*, 1906, ii, p. 242.
- [6] *Idem*. *Proc. Roy. Soc. Med.*, 1909, ii (Anæsth. Sect.), p. 31.
- [7] *Idem*. *Ibid.*, 1910-11, iv (Path. Sect.), p. 205.

DISCUSSION.

The PRESIDENT (Dr. Blumfeld) said that Dr. Levy's laboratory work was of the greatest possible interest to members of the Section, who would naturally criticize it from the point of view of their own clinical experience. He knew that Dr. Levy would welcome all such criticism, and where the clinical facts seemed at variance with the theory he advanced would explain to the Section how the two were correlated. Whether they accepted Dr. Levy's explanation as covering the great majority of chloroform deaths or not, it was at any rate one that appeared to account most satisfactorily for many fatalities which had hitherto been difficult to understand. All anæsthetists of experience realized that there were, broadly speaking, two different kinds of chloroform fatality. There was, firstly, the over-dose kind—the kind which was preventible, and which might fairly be said never to occur in experienced hands. On the other hand, there was the death that happened suddenly, early in the course of administration or after administration had ceased: at any rate when narcosis was in a light degree and when over-dosage could be excluded. Such cases had occurred under experienced administrators, and often explanations based upon respiratory interference had been made to account for them. Dr. Blumfeld thought it highly probable that some of these cases were instances of fatal ventricular fibrillation. With regard to the preliminary use of atropine, he approved of it, though he realized that the physiological support which Dr. Embley offered for such approval was to some extent negatived by the conclusions of Dr. Levy, and regretted that there was not present on this occasion a physiologist of the school which maintained that all chloroform deaths were due to the inhalation of too strong a vapour: such a man might have, to use a sporting term, "extended" Dr. Levy more than he (Dr. Blumfeld) was capable of doing. He wished, however, to thank the author most warmly for bringing his work before the Section.

Mr. RICHARD GILL: I cordially agree with the remarks made by our President respecting the importance, and particularly the scientific importance, of the address which Dr. Levy has given us. I well remember an occasion when several eminent physicians and physiologists were present at an operation for dividing the left vagus in a female with exophthalmic goitre. It was anticipated that acceleration of the pulse would result. No obvious alteration, however, appeared. I know of two other instances in the human subject in which the left vagus was divided, without any immediate or remote pulse disturbance. Experience drawn from section of the vagus in man would therefore seem to conflict with the results of similar operations on the lower animals, and I think the belief is more commonly entertained now than formerly that it is hazardous to deduce the same results happening in man from those which occur in like operations on the lower animals. I am glad to observe

that Dr. Levy takes into consideration the action of causes other than chloroform during the administration of the latter. He mentioned the emotional factor, oftentimes troublesome during the first stage of the induction of anæsthesia. The emotional patient presents quick pulse with small volume and acceleration of respiration. The introduction of chloroform vapour into the chloroform-air atmosphere administered should be so nicely regulated as not to interfere unduly with the action of the respiratory machine. Instead of making haste we have to proceed slowly up to the moment when the vasomotor and respiratory centres are released from stimulation. For the fearful patient ceases to be afraid when he discovers that he has no ground for his fear.

Dr. Levy tells us that chloroform has no direct effect on the heart, and I quite agree with him. But, unfortunately, fatalities occur, and the question is, "How are these brought about?" From his experiments on the lower animals the following answer appears, according to Dr. Levy, to be conclusive: After a period of abnormal activity, fibrillation of the left ventricular muscles produced by stimulation of the centres in the spinal cord or medulla eventually appears, continues for a short time, and is followed by syncope, which is fatal. Now I venture to point out that if, before reaching the stage of ventricular fibrillation, Dr. Levy had applied the means for resuscitating the animal experimented on, he might have succeeded in restoring it to its natural state. In these circumstances, and supposing the restoration of the animal, the fibrillary stage would not have been reached, and a fact for the construction of an hypothesis would not be forthcoming. It should be noted also that fibrillary contraction, upon which Dr. Levy so strongly insists, does not embrace the whole phase of the heart's abnormal activity. Fibrillation of the left ventricular muscles occupies but a small part, and that towards the end, of the course of the complication or the abnormal state in which the animal is found. Might not the real cause of the fibrillation be referred to the last stages in the progressive exhaustion of the cardiac energy from chloroform narcosis—i.e., an over-dose of chloroform in the blood? Dr. Levy does not exclude that possibility, because he does not enumerate all the other signs or results accompanying fibrillation which are essential to the rational consideration of the causation of it. Thus he does not give us any information as to the condition of the lungs, whether congested and to what extent; and the pupil, whether dilated and to what degree, and the degree of sluggishness of the iris muscle; nor does he tell us what the actual state of the respiratory machine was at the time of the appearance of fibrillations of the left ventricular muscles. It is dangerous to draw conclusions from a single fact or result, and unless all the material evidence is before us it is impossible to reach a true solution. Chloroform may be administered to the lower animals, and, from what I have seen, it usually is administered in excessive doses. As far as results are concerned, there is much perplexity arising from moderate degrees of over-dose, when unduly prolonged, being associated with crisis, while these are apparently innocuous for shorter experiments. But unless we have the means of rendering the progress of chloroform

activity uniform, and confining its action to the lowest degree associated with unconsciousness, it will be impossible to observe with accuracy the appearance, the progress, and the termination of intervening causes. And Dr. Levy sounded a very true note when he said that what is wanted by administrators of chloroform is a uniform course. I think the first step towards that desirable end is to restrict the term "anæsthesia" to the lowest degree of chloroform action producing unconsciousness, and to regard it as a state made up of the following components: automatic respiration, frequency 28, natural colour of the complexion, contracted pupil, pulse 73. Now, by means of the uniform course of chloroform anæsthesia, it is possible to observe the beginning and progress of a complicatory cause whenever it operates, and from the record of the abnormal results, tabulated in the order of their appearance, to isolate the true nature of it. The complications involving cardiac changes are the following: primary cardiac syncope, reflex stimulation of the vasomotor centre, and direct stomachic action. In primary cardiac syncope the phenomena which appear first are sudden fall of blood-pressure and complete dilatation of the pupil. The action of the respiratory machine is next affected, the range of its movement progressively diminishing until it ceases after a period of thirty-five seconds. In this group of complications I have never detected any alteration in the pulse up to the moment of the sudden failure of it. In reflex stimulation of the vasomotor centre the progress of the alterations in pulse, respiration and pupil is very rapid, and temporary collapse is manifest at the end of five seconds if the degree of stimulation be intense. The results appearing first are sudden fall of blood-pressure and wide dilatation of the pupil—just as in primary cardiac syncope—followed by a rapid and progressive reduction in respiratory movements, which apparently cease at the end of five seconds. The difference in the attitude of respiratory action to fall of blood-pressure, arising from different causes, serves as the means of distinguishing the particular cause of it. But the respiratory machine is not totally inactive; faint movements may be observed in the lower abdomen, and these during the continuance of restorative measures—viz., the displacement forwards of the base of the tongue, which allows of the free passage of air through the glottis, and lowering the head and shoulders—gradually and progressively increase until, at the end of sixty-five seconds, they reach their natural condition. The pulse reappears at the wrist about midway in the course towards recovery, and, proportionately to the increase in the respiratory wave, increases in volume and strength until it reaches its natural state. In this group of complications I have never detected any change in the pulse, either before the failure of it or during the subsequent period of the return of it to the normal, which could be ascribed to ventricular fibrillation.

In the third group the first phenomenon to appear is inhibition of the respiratory machine, and this is followed very quickly by a corresponding fall of blood-pressure. Just before the act of vomiting the pulse may be temporarily imperceptible. After the contents of the stomach have been expelled, both pulse and respirations rapidly return to their natural conditions in this

group. I have never observed that abnormality in the pulse which Dr. Levy associates with fibrillation of the ventricle. But the two latter groups of complications may be further complicated by the improper action of chloroform either in the airway as a respiratory over-dose or in the blood as a blood over-dose. If there be an excessive amount of chloroform vapour in the airway this will delay the normal progress in the complex act of vomiting—a natural function—and, as a consequence, the action of the heart becomes embarrassed. And if, in reflex stimulation of the vasomotor centre, the degree of chloroform action be narcotic instead of anæsthetic, the natural return of the blood from the splanchnic area to the left ventricle will be more or less impeded at the alveolar region according to the greater or less degree of pulmonic congestion—i.e., distension of the pulmonary artery. In chloroform narcosis the conditions of the right and left ventricles are altered from the normal, so that the former is unduly full and the latter is imperfectly supplied. Now it is not difficult to perceive that a heart in these abnormal conditions will be still more distressed whenever the drain of blood is increased from the left, and distension is raised in the right ventricle. Do fibrillations of the left ventricle occur in those instances in which the heart is embarrassed and eventually distressed? From what Dr. Levy has demonstrated to us it would appear that they do; but he will appreciate the extreme difficulty there must always be in proving, or rather showing, that they actually occur in the human heart. Because, in the latter, whenever a complication appears and is associated with a state of crisis, there is no time to be lost in ascertaining the actual condition of the heart—all effort must be concentrated on the restoration of the patient. But in the case of the lower animals, if the nature of the experiment requires it, the condition of the heart may be observed, though the animal is moribund; thus the life of a dog might be sacrificed in order to study a phase in the conduct of its heart in abnormal circumstances. Experimentalists can acquire information in that way which is denied the practical anæsthetist. There is, however, a phase in the conduct of a “tired” heart which approximates in some measure to the fibrillary features of the cardiograms shown by Dr. Levy. Towards the last stages of asphyxia, and while the right ventricle is being progressively overworked by increasing resistance at the alveoli, the frequency of contraction, instead of remaining slow, becomes accelerated, and just before the heart ceases to functionate there appears a short interval in which the contractions are very rapid and of small range. Now I cannot assert that that phase of a tired heart in all respects corresponds to the fibrillary periods illustrated by Dr. Levy, for the simple reason that he does not define, so far as chloroform is concerned, the state of the animals at the time of the occurrence of these abnormal contractions. If the animals in which ventricular fibrillation appeared were in a state of chloroform narcosis, it is my opinion that Dr. Levy has misinterpreted a natural phase in the conduct of a tired heart. But whether this be so or not, it is certain that, whenever chloroform is limited to the lowest degree of action associated with unconsciousness, no such abnormalities as are described by Dr. Levy ever

appear. And further, if the proportion of chloroform in the chloroform-air atmosphere is reduced, methodically, at the end of each succeeding stage, uniformity in the course of its action, which he points to as being most desirable, will be attained. And not only a uniform action, but also security of the heart against being overworked. I am not so convinced, as Dr. Levy says he is, by the evidence of his experiments, which he regards as conclusive. And I think some kind of checking experiment might be undertaken to exclude the possibilities of erroneous inference. Thus, the dogs might be equally narcotized; at a given stage, when cardiac frequency is presented, recovery by artificial means is successfully effected in one, while in the other narcosis is allowed to proceed up to the appearance of abnormal ventricular contractions. Then we should learn, from comparing the respective cardiograms, that "fibrillations" do not appear as the first manifestations of cardiac exhaustion, but that these express, later on, the inability of the heart to perform its function in conditions which have become too powerful for it.

Dr. LEVY, in reply to the President's remarks, said he was asked why there was a greater liability to death after a short administration than after a long one: the reason was that the heart was less depressed by the short administration, and that the recovery from depression—i.e., passive stimulation—was more active. With regard to the use of atropine—he believed that it was a mistake to attempt to abolish the vagal tone, which tended to diminish the risk of ventricular fibrillation under chloroform; atropine was an acknowledged failure as a prophylactic against chloroform syncope, otherwise it was inconceivable that it was not employed in routine practice. As he had stated, when deep anæsthesia was required under exceptional circumstances, atropine might prove beneficial in diminishing a tendency to heart-block and to the spontaneous vagal action which Embley had described in over-dosed dogs. Dr. Blumfeld's suggestion that only deaths from under-dose occurred in experienced hands was probably perfectly correct, but he thought that this observation must be extended almost without reserve to less experienced hands likewise, otherwise how did it happen that at least 87 per cent. of deaths, and probably more, could be shown not to be caused by over-dose? He recommended the analysis of clinical reports to Dr. Blumfeld's careful consideration.

In reply to Mr. Gill, he said that no doubt the patient who had the vagus nerve cut under chloroform was fully anæsthetized, and under such circumstances no cardiac irregularities would be observed. He took an opposite view to Mr. Gill, and considered that by far the greater danger to life existed in proportion as the patient was under-dosed. He thought that the case of syncope which Mr. Gill described as a result of manipulation of an inflamed intestine was the result of ventricular fibrillation from a sensory reflex; the sudden pallor, dilated pupils, and persistent respiration, were typical of this very sudden form of cardiac syncope.

In reply to Mrs. Berry, he said that the only death of which he had had personal experience occurred when he was anæsthetist to Guy's Hospital eight

years ago ; he was using a regulating inhaler, and the death occurred when the patient was not fully anæsthetized ; it was this fatality which convinced him that the accepted views regarding chloroform syncope were erroneous, and he had been investigating the matter since that time. The only figures relating to deaths under chloroform administered by a regulating inhaler were those referring to the use of the Vernon Harcourt inhaler ; four deaths on the operating table occurred in the course of 5,000 administrations in expert hands ; at least two of these cases were typical chloroform deaths. He had particulars of other deaths occurring during the administration of chloroform with this inhaler, and it was perfectly evident that the use of a regulating inhaler did not eradicate fatalities. Provided an inhaler supplied a fully sufficient maximum percentage of chloroform, and was used to ensure a continuous supply of vapour, it was a desirable appliance, but if it were employed to attenuate the vapour to the lowest possible percentage, as was now taught, its use could not be too strongly deprecated.

PROCEEDINGS
OF THE
ROYAL SOCIETY OF MEDICINE

VOLUME THE SEVENTH

COMPRISING THE REPORT OF THE PROCEEDINGS FOR THE
SESSION 1913-14

Section 3.
PNEUMOLOGICAL & CLIMATOLOGICAL SECTION



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Balneological and Climatological Section.

October 23, 1913.

Dr. F. A. DE T. MOUILLOT, President of the Section, in the Chair.

PRESIDENTIAL ADDRESS.

Some Lessons derived from Twenty Years' Spa Practice.

THE choice of a subject suitable for an address of this kind is always difficult, but as I have just completed my twentieth season in spa practice it seemed to me that it would be an opportune time to record some of my experiences and tell you, who are interested in such matters, what I, as a practical man, think of the cause and treatment of some of the diseases treated at watering-places.

A spa doctor's practice is of an unusual kind. A very large number of individuals come under his care, remain with him from two to four weeks, and then leave for other surroundings, perhaps becoming annual visitors or perhaps returning at some distant date.

I have had an analysis made of 1,000 consecutive cases. There were 539 males to 461 females. This is contrary to the general opinion that spas are mainly frequented by women. Of the 539 males, 331 were between 40 and 60 and 444 between 40 and 70 years of age. Of the 461 women, 251 were between 40 and 60 and 322 between 40 and 70 years of age. So that, of the 1,000 cases 766 were between 40 and 70 years of age.

A second series of 800 cases shows 458 males and 342 females; 307 males between 40 and 70 years of age, and 262 females between the same ages. From this it would appear that a spa physician in a fair practice ought to have a special knowledge of the various chronic diseases which are prevalent amongst well-to-do people of that period of life extending from 40 to 70 years of age.

Now, broadly speaking, the bulk of these people suffer from diseases of faulty metabolism, due in many cases to improper diet: that is,

improper, having regard to the age, habits of life, and general state of the digestive organs. This more fully applies to the male patients. The females suffer from dietetic errors also, but additional trouble at the period of life I am now considering seems to be brought about by changes in the secretion of the ductless glands.

If I were asked what was the most common error in diet amongst middle-aged men, I should say without hesitation that it was the consumption of too much farinaceous food, and, more particularly, the habit of eating bread with meals to excess. I have often found that patients eat as much bread with their meals as would make a substantial meal if the other items were excluded. During the earlier period of life the digestive organs are capable of dealing with this farinaceous excess, but the time comes with many when glycosuria, flatulent distension, with its consequent dilatations of stomach and bowels, and other more remote symptoms pointing to intestinal toxæmia, give warning that this excess can no longer be tolerated. When glycosuria is diagnosed the diet is often altered in the proper manner, but unfortunately, when it is not, the patient frequently adds fuel to the fire by taking more farinaceous food in the form of milk puddings, &c., in the vain endeavour to relieve indigestion or other symptoms. I frequently find patients advised to give up potatoes, but few seem to realize that "the staff of life" can be too freely eaten.

An early sign of mal-digestion of starch is persistent phosphaturia, which I have frequently seen followed by glycosuria. When starch is imperfectly digested it gives rise to many poisons, and it depends mainly upon the power of the liver to destroy them whether the patient suffers from general symptoms or not. This conception of the liver as the great poison filter leads to a proper understanding of many difficult problems. One man is able to eat and drink almost anything without immediate ill-effect, whilst another suffers severely for a very slight indiscretion. The latter type of man will tell you that he would like "to do himself well," but has never been able to take wine at night without being ill next day. He also complains that even a day's inaction of the bowels produces in him malaise and lassitude. In these cases the liver may be said to be deficient in that reserve power which Nature gives to most of our organs. Just as one finds a heart capable of doing ordinary work but failing on extra exertion, so one finds livers capable of dealing with simple, well-regulated diet, failing to deal adequately with the slightest excess. It is curious to know how often these people have had parents who have lived too well and had gout. I have often

told them that they should be thankful they were unable to do as their forbears did.

This matter of excessive bread consumption in the middle-aged is worthy of very serious consideration, as I know it to be responsible for much ill-health and discomfort. It is extremely difficult to get patients to give up bread, because at first they feel empty so soon after a meal that they are apt to think they are being starved. Perseverance, however, soon accustoms the stomach to its less padded condition, and a feeling of well-being and comfort rewards the patient for his self-denial.

I do not wish it to be understood that I am in any way opposed to the moderate use of farinaceous food in those who are capable of digesting it. It is the habit of eating bread in excess which I think is so injurious to the health of the middle-aged. To this audience I need hardly say that bread includes toast, though I find that, with the laity, the belief is general that, however injurious bread may be, dry toast may be eaten with great freedom. Toast is, from physical causes, more easy to digest, no doubt, but the evaporation of the moisture which toasting produces must cause an actual increase of starch percentage.

Closely connected with the inability to digest starch in middle life is the disease known as glycosuria. I have a considerable number of such cases under annual treatment with sugar varying from a trace to 10 per cent. or more, and find it rare indeed that the glycosuria does not disappear under a course of sulphur water and strict diet. In my opinion there is no very marked line of demarcation between diabetes and glycosuria, but I have noticed that in the middle-aged the urine retains its colour no matter how high the specific gravity may be or how much sugar it contains, contrasting with the colourless urine of the youthful diabetic. It may be said that this difference is a matter of dilution, but I do not think that is the case, as normally coloured urine stands a great deal of dilution without altogether losing its yellow tint. If I may say so, I think this disease is treated too lightly by the profession and that the necessity for dieting is not sufficiently insisted upon. It is evident that the patient does not digest starch normally, and for that reason alone should not take it. I have seen many patients who were told it was unnecessary to diet whilst at the same time they were given codeia. Now that drug ought to be reserved for cases of the youthful type which are uninfluenced by abstention from farinaceous food. Many glycosuria patients have told me that the affection had brought about a loss of confidence in their

own judgment as well as an unusual irritability of temper. This statement has been volunteered to me so often that I cannot regard it as mere coincidence. Glycosuria in my practice is much more common in males than in females—1 in 40 males suffered whilst only 1 in 114 females.

Obesity is another affection associated with faulty metabolism of farinaceous food, but I shall not deal specially with it here except to say that the treatment for it at some spas is very injudicious. To take off a stone or two in weight by drastic purgation, profuse sweating, and diet limited in quantity, is often productive of great harm, especially in patients in middle life or later. The duty of the physician is to correct any faults in diet and to show the patient how a gradual reduction in weight can be obtained without injury to general health. This course may not be so showy but I am sure it is the sound one.

In every respect the diet for the middle-aged should be simple, and I do not find that my patients as a class object to living simply. I believe of late years there has been a decided reaction against the unduly long and varied menu and that in the class of people under consideration excess in food or drink is unusual. The fact that the liver is now recognized as a great physiological filter leads one to look on articles of diet from quite a different point of view. It makes one realize that it matters less what a particular article is than what it does: A lemon squash with sugar contains more acid and sweetness than a considerable quantity of champagne or port, but these wines are capable of precipitating an attack of gout in vulnerable people, not from their sweetness or acidity, but because they have through their ethers the power of inhibiting the action of the liver cells. From this cause poisons are permitted to enter the general circulation, causing, in some cases, an attack of gout, and in others headache, sickness, general malaise, or other symptoms of toxæmia. An interesting fact, told to me by many patients whose farinaceous intake I have lessened, is that they have found themselves able to take wine at public dinners, &c., with a freedom from after ill-effects which astonished and gratified them. It is not difficult to account for this, as I take it that fewer poisons are formed and the liver is therefore capable of dealing with them, even though the wines have diminished the activity of its cells.

In women I find a marked tendency to take too little fluid, many, being impressed with the idea that drinking with meals makes them fat, take their food dry. This is a good habit, always providing that a sufficiency of fluid is consumed between meals. Even if this pre-

caution is impressed on the patient at first it is soon forgotten, and as a consequence constipation and certain muscular and joint pains often follow. The patient is dehydrated and is often surprised and annoyed at the rapid initial increase of weight when placed under treatment at a spa: the reason of the increase, of course, being that the dehydrated tissues are thirsting for fluid. In dieting women one must always remember that as a rule they are small feeders, and though quite willing to give up any particular article of diet are not so ready to make up the deficiency by consuming more of some other food. As to drink, I favour a light white wine if the patient will take alcohol. The indiscriminate recommendation of whisky is unwise. It should not be forgotten that whisky is a liquid easily obtained, and frequently taken between meals, whereas few seem inclined to take wine except at meal-times. Most people should drink at least a pint of some soft water daily apart from meals, and I think that the educational value of spa treatment in this respect is valuable.

The conclusion I have come to as to diet for the middle-aged is that strict moderation in quantity combined with simplicity as regards quality are the main things to enjoin, and that there is no need to worry with minute details, such as whether tomatoes or asparagus should be eaten or whether mutton should be always given a preference over beef. In particular I advise moderation in starch, finding that such moderation tends to preserve that condition of body which enables its functions to be carried out unhampered by unhealthy deposits of fat. It is now easier to procure substitutes for bread than it used to be, but I am sorry to say there are many articles advertised and sold as suitable to the diabetic and obese which are really not so. To the obese it perhaps does not matter a great deal, but all foods sold as suitable to a diabetic ought to be officially analysed and severe punishment given to the authors of any untrue statement.

I have recently read the late Dr. Murchison's lectures on "Functional Diseases of the Liver." The lectures were read before the Royal College of Physicians in 1874, and when I read them a few months ago I was amazed at the wonderful insight Dr. Murchison had into the true nature of gout and its allies. The lectures will repay reading, and I gladly recommend them to the notice of those specially interested in these subjects. The true old-fashioned gout is becoming rarer every year, whereas the defective liver is becoming more frequent. Perhaps the latter, by rendering excess in food or drink immediately unpleasant, tends to limit the number of people who acquire acute gout.

6 Mouillot: *Some Lessons from Twenty Years' Spa Practice*

A large group of patients seeking relief at spas suffer from neurasthenia in one of its many forms. The cause in the majority of cases is intestinal toxæmia, produced either by an excess of poisons manufactured in the intestinal canal or by a deficient power on the part of the liver to deal with what may be termed a normal amount. Undue retention of fæces in the rectum is often found on examination, even when the patient tells you that the bowels are regular. When this is the case treatment by intestinal lavage ought to precede the administration of waters, as this course renders it much more likely that the waters will act properly. Many of these people are in the habit of taking salines regularly which, though acting, leave a good deal of solid matter behind. Intestinal lavage often shows that the patient has mucous colitis, in which case the lavage should be continued. Another factor requiring attention is the state of the refraction, and that even when headaches of the migraine type are not a feature of the case. Eye-strain is a potent cause of neurasthenia, and the sick headache which so often accompanies it is probably a toxæmia directed to the brain on account of the error of refraction. One finds in middle age that the headaches tend to disappear, to be replaced by other forms of toxæmia such as gout and fibrositis, but in all neurasthenic cases I always suggest a thorough examination of the eyes.

Instruments for measuring blood-pressure are becoming much used in spa practice, and they are undoubtedly of great help in deciding on the kind and temperature of baths. I took the blood-pressure in 800 consecutive patients and find the figures average out as follows:—

						Males	Females
Between the ages of 70 and 80	...	...	...	...	...	162	157
„ „ 60 „ 70	...	...	...	...	...	149	167
„ „ 50 „ 60	...	...	...	...	...	164	164
„ „ 40 „ 50	...	...	...	...	...	137	146

The general tendency of spa treatment is to reduce blood-pressure, and I find, as would be expected, that as a rule patients whose pressure is high stand baths better than those whose pressure is below the average.

A point I have noticed in spa practice is that patients come for rheumatism of the feet who really suffer from flat foot. It is therefore good practice to make patients complaining of foot pain stand for some time in their bare feet and watch the result. I have often noticed that an arch which is too high gives rise to painful feet also, and improvement occurs when a support is worn. Another point one learns from spa practice is that many people are able to lead active and useful lives

who are seriously ill. I make a fairly thorough examination of all my patients and have been surprised to find albuminuria, glycosuria, enlarged livers, hypertrophied and irregular hearts and such like in people who have no idea that they are not perfectly sound. Just as an instance: I have a patient, a Mr. M., now aged 61, who first consulted me in 1902. His urine contained $\frac{1}{4}$ column of albumin which he said had been present for about nine years. I saw him in 1911 and learned that in 1910 he had had uræmic convulsions from which he nearly died. He had large quantities of albumin in his urine, and his blood-pressure was 250. I should say that he always took a considerable amount of alcohol and that the convulsions came on after a bout of alcoholic excess. I saw him again in 1912, and his blood-pressure was 210 and the quantity of albumin very large. He came again this year, and his blood-pressure was 250 and the albumin as before. During all these years this gentleman has led a very active and strenuous business life, and except for the convulsions has never known a day's illness. A case like this makes one think that it is a mistake to give too dismal a prognosis even with very unfavourable symptoms.

In the year 1903 I had the honour of opening a discussion in the old Balneological Society. The subject was "The Dietetic Factor in Spa Treatment." In the course of my speech I made use of the following words:¹ "Besides the confusion between weight and fat there is also a confusion between bulk and fat. For many years past I have been observing a number of patients who are bulky, and yet the substance which makes them so is not fat. The subcutaneous tissue is infiltrated with a mucoid substance, over which the skin is tight, and when the skin is pinched it has a curious puckered appearance. The substance is the same, I think, as that present in adiposis dolorosa, and is more common than generally supposed. Diet has no effect on this condition, but thyroid extract often improves it." No subsequent speaker took any notice of these words, but in the course of a discussion on "Some Aspects of Obesity," at the same Society in 1904, Dr. Luff said:² "Lastly there was the small class of cases which Dr. Mouillot had referred to at the Society, and of which he (Dr. Luff) had seen a few cases. They were cases akin to myxœdema, but without the monotonous, sad speech met with in myxœdematous patients, and without their direct affection of the thyroid gland. He referred to those

¹ *Journ. Baln. and Climat.*, 1903, vii, p. 144.

² *Ibid.*, 1904, viii, p. 203.

cases which Dr. Mouillot said became bulky rather than fat; in the subcutaneous tissues some mucoid substance collected, which felt quite different from fat when the skin was pinched. Such cases did extremely well on thyroid extract and dieting was of very little use to them."

I want, on this occasion, to dilate more fully on those cases which have points of interest and perplexity. My attention was first drawn to them by finding that there was a large number of women who weighed very heavily, but who did not respond to dietetic treatment. Little by little I began to associate other symptoms with this condition, and found that the patients' limbs were tender to the touch, that they were always finding bruises for which they were unable to account, that they suffered considerable pain, and that it was impossible for them to walk any distance on account of muscular weakness. I then took to examining every patient for this condition, and found that it was extremely common in middle age, but rarely present in youth or old age. I had many really serious cases about which I wrote to my medical correspondents, but my diagnosis was often ignored. Dr. Leonard Williams could tell you of a lady, a Mrs. S., whom I saw in 1906, and who consulted him last year. Mrs. S. told him that she had been to see many physicians about her health and that they had all laughed at the diagnosis I had made.

There was then nothing written on the subject, at all events, in English, but I had recently the pleasure of receiving a paper from Professor Stockman, written in 1911, which escaped my notice at the time. In this paper Professor Stockman gives a lucid account of the symptoms and pathology of this ailment, which in the main accords with my experience. He states that the first account he saw of this disease was in a paper written by Dr. Kjellberg, of Stockholm. In this paper, written in 1909, the disease was called panniculitis. Dercum had previously written of a condition which he called adiposis dolorosa, which is a similar if not an identical disease. In it, however, the special symptoms seem to be pain in lobulated masses of fat; whilst Professor Stockman believes, and I agree with him, that an essential element in panniculitis is the increase in the fibrous tissue underlying the skin. From the symptoms I should think the increase often extends to the fascia surrounding the muscles. If this be the true and complete pathology of the disease, there would be nothing to distinguish it from ordinary fibrositis, but though I believe Professor Stockman's account is true as far as it goes, I cannot think it is the whole truth, for the following reasons: Fibrositis is common to both sexes; indeed one

special form of it, lumbago, is much more common in men, but though I have looked for it for fifteen years I have not yet seen a case of panniculitis except in the female sex. After a certain age I have noticed a difference in the male and female skin. The male skin is always freely separable from the underlying tissue, but the female skin often becomes adherent, or as I call it, "hide-bound," and cannot be pinched up. This is specially the case in the skin above the knees and over the deltoid. I find this condition very usual about middle life, and often there are no symptoms.

Now in the cases we are considering the skin is quite adherent, and when pressed between the fingers shows marked puckering, whilst the feeling it gives is that of some semi-solid material in the subcutaneous tissue. Then the symptoms which accompany this condition are rarely complained of by men. One does not hear men state that they bruise at the slightest touch, and that pinching or massage is intensely painful. When a man has hard muscles he is always able to use them, but I have many women patients who have been complimented by their friends, and even by their medical advisers, on the hardness of their limb muscles, and yet are unable to walk a quarter of a mile without extreme muscular fatigue. For the reason, then, that the disease is limited to the female sex, I say that fibrositis cannot be the sole cause, nor can any toxin common to both sexes be the only ætiological factor.

The great majority of my cases are in middle life, but I had a very severe one in a lady aged 29, who became extraordinarily bulky after parturition. I have only had two cases under the age of 30—the other was a young unmarried lady.

I am absolutely convinced that the cause must be looked for in some change in the character or quantity of the thyroid secretion. This change may be brought about by change in the ovarian secretion, but whether this be so or not thyroid gland will cure, or at least greatly improve, the condition of patients suffering from this troublesome disorder.

The great importance of the ductless glands and their interaction is now becoming better known. A member of this Section, Dr. Leonard Williams, has done much good work on this subject. We all know that hyperthyroidism is the dominant factor in Graves's disease and that hypothyroidism is the essential cause of myxœdema. If this be so it surely follows that an increase in the activity of the gland insufficient to cause Graves's disease may produce one set of symptoms, whilst a deficiency not great enough to cause myxœdema may produce another.

We see in practice patients of excitable nervous temperament, who have a more than usually rapid pulse, and we find slight thyroid enlargement or learn that the thyroid swells at each menstrual period; whilst on the other hand we see the class of case I am endeavouring to describe where there is a marked change in the subcutaneous tissue not amounting to myxœdema, but I believe akin to it. In the first mentioned class it is reasonable to suppose that there is an increase in thyroid function, whilst in the second there is ground for believing that thyroid activity is diminished.

There must be intermediate conditions between normal thyroid function and Graves's disease, and connecting links between the normal function and myxœdema, but I have often found it difficult to get my friends to admit that you can have hyperthyroidism without Graves's disease or hypothyroidism without myxœdema. It is generally easy to prove the existence of hypothyroidism because the result of thyroid administration is so striking; but as I know of no sure way of limiting excessive thyroid activity, one cannot prove its existence by success in treatment.

If panniculitis is a disease due to alteration in thyroid function its rarity in the male is what one would expect, for Osler states that myxœdema is more frequent in females in the proportion of six to one, and that Graves's disease is so in proportion of twenty to one. In my thirty-three years' experience I have only seen one male affected with Graves's disease, and have not yet seen a case of myxœdema in a male patient.

The symptoms I lay special stress upon are:—

- (1) Pain on handling of muscles.
- (2) Readiness with which patient bruises.
- (3) General tendency to neuritis, muscular pain, &c.
- (4) Marked feeling of muscular debility.
- (5) Thickening of the subcutaneous tissue, which puckers when pressed between the fingers.
- (6) Some cases, early alopecia.

I here give some brief notes of a few cases:—

Mrs. S. (the case afterwards seen by Dr. Leonard Williams), aged 39. Weight, 11 st. 2½ lb. Suffering from much pain called "rheumatic." Muscles extremely hard and the subcutaneous tissue infiltrated. Thyroid and massage appeared to do good, but the treatment was not persisted in after she left Harrogate, as my diagnosis was not considered correct by her medical adviser.

The worst case I know is Mrs. X., aged 45. Married in her early twenties, and her weight was 9 st. 6 lb. at the time. Had an abortion four months after marriage, after which she began to grow bulky. Has always been a small eater, and has dieted for obesity, but in spite of this she is now 17 st. She is active-minded and most anxious to take exercise, but the pain and fatigue produced by walking renders it impossible for her to do so. All her limbs are hard, and her friends think in consequence that she is capable of taking any amount of exercise. The subcutaneous tissue is so thick that the muscles are tied up, and it is impossible anywhere to separate the subcutaneous tissue from the tissues underlying it. The words "hide-bound" quite aptly describe her condition. The lady is not in the least obese, though, as I say, weighing 17 st.

I saw a Mrs. Z., lately, aged 48, who had been under the care of many doctors and has had many "cures" at various spas, including a full course of Weir-Mitchell treatment. She was a severe case of this condition, and her improvement in a few weeks on thyroid and hot-water massage was remarkable.

Miss R., aged 49, whom I attended in 1912 for colitis and constipation, came again this year suffering from most severe brachial neuritis. I found that the menstrual period had suddenly stopped during the year, and that she had increased in weight by a stone. There was a most remarkable collection of fibrous nodules about the deltoid and the pectoral muscles, and in addition I found extensive panniculitis. Iodothyrene and massage effected a cure, though the massage caused much pain. This case leads me to say that in this condition you cannot delay massage because it is at first painful. Hot-water massage is much less painful than dry, and I think more efficacious.

I hope that the attention given lately to this disease will lead to its more general recognition, as many sufferers could be benefited if there was not so much scepticism as to the existence of an affection which in various degrees is very widespread.

I am often asked what I think of the prospects of balneology in this country. It is with pleasure that I can say after my twenty seasons' experience that I think they are very favourable. When years ago a leading member of our profession (the late Sir William Roberts) wrote that all mineral waters containing chloride of sodium must be injurious to the gouty on account of their effect in precipitating sodium bi-urate it was thought that the gouty would cease to visit spas like Harrogate and that their day was over.

The now broader view taken of gout and its allied disorders and the great attention paid now to "intestinal toxæmia" have produced a marked reaction. Attention is now more concentrated on what a mineral water does than on its exact chemical constitution. It is obvious that a water hypertonic as regards blood serum if it acts on the bowels at all does so as a stimulating flush without itself being absorbed. This is what takes place with our strong sulphur saline. A copious liquid evacuation is produced, and the liquid is that taken by the mouth and not that drawn from the blood-vessels of the intestine. Such a flush removes poisons which it might have been out of the power of the liver to destroy.

I have no fear that the custom of drinking of waters at spas will die out. The hot springs, the indifferent waters, the saline group, all have their uses and will hold their own. The patients know the benefit they have received and return to the same spa or go to another the following year.

The cordial friendships which the old Balneological Society and this Section have brought about amongst the various practitioners at spas and climatological stations tend to the general good of our health resorts, and though we each naturally think most of our own spa we are taught by contact with practitioners from other spas how much good work is done at these kindred stations.

Another reason which compels me to have faith in the continued prosperity of the British spa is that in every spa now the vast majority of practitioners are of such a kind as to deserve the confidence of their professional brethren, both as to their capacity to treat their patients in a satisfactory manner and as to their desire to conform to the rules of medical ethics.

In a standard text-book I find the following words: "Much of the humbuggery in the profession lingers about mineral waters." In so far as this applies to England I deny the truth of that statement. I am personally acquainted with a great number of spa doctors. I find them men of intelligence, anxious to acquire the latest information about the various diseases they treat, and I also find that they are sincerely desirous of conducting their work to the satisfaction of the medical profession and the patients committed to their charge. In short, I find little "humbuggery," and consider that our British spa doctors are of such a class that to attain a respectable position amongst them is no mean object of professional ambition.

Balneological and Climatological Section.

December 4, 1913.

Dr. F. A. DE T. MOUILLOT, President of the Section, in the Chair.

Mineral Springs : Their Analyses, Classification, Therapeutic Uses, and Newer Methods of Application ; with Special Reference to American Springs.

By GUY HINSDALE, M.D.¹

THE modern student and practitioner is confronted with the most difficult and abstruse questions, relating to the chemistry and physiological action of mineral springs, questions that are almost the despair of one of only ordinary scientific training. The chemical analyses of waters on which so much stress has been laid, ever since analytical chemistry has been employed to determine their character, are now themselves in process of passing into history. A glance at recent publications of the chemical division of the United States Geological Survey shows how completely the modern chemist has changed his notation to conform with the latest discoveries in the science of molecules, radicals, atoms and ions.²

The definition of a mineral water varies with the point of view of the chemist, the geologist, the physician, and the dealer. Each has his standard, and no arbitrary line depending on total content of minerals or salts in solution can be drawn between so-called pure waters and those commonly denominated as mineral waters. Indeed, the most popular and commercially valuable "mineral" water in America has almost a minimum of solid constituents.

In what form and in what combinations the simplest salts exist in mineral waters or in artificial solutions demands the most serious attention. Take, for example, pure water and add to it sodium

¹ Secretary of the American Climatological Association.

² See Chase Palmer, "The Geo-chemical Interpretation of Water Analysis," Bulletin 479, United States Geological Survey, Washington, 1911; H. P. Talbot and A. A. Blanchard, "The Electrolytic Dissociation Theory," The Macmillan Co., New York, 1905.

chloride and potassium sulphate. We have instantly formed in solution sodium sulphate and potassium chloride in addition to the two original salts, as well as the sodium, potassium, chloride and sulphate ions; so the chemists tell us. The electrolytic dissociation theory goes further and gives us an entirely new conception of the relation of radicals or ions in various solutions.

An inkling of the state of the radicals of salts in solution is given in what analytical chemists in later years have been stating as the "*hypothetical combinations*" appended to their analysis so as to correlate them with the time-honoured method of notation.

In the past we have been furnished with data of the most diverse kinds. The late Dr. Crook, after an inspection of about one thousand analyses, noted that at least forty-two methods of stating results have been employed. They are all now likely to be superseded by the ionic form which assigns weights directly to the chemically active parts of the dissolved substances instead of using those parts to build imaginary structures (Chase Palmer). The sooner we adopt a value of milligrammes per litre, or parts per million, discarding the historic "gallon," and think only of radicals instead of salts, we shall make a great advance and put ourselves in harmony with modern chemical nomenclature.

For a comparison of these methods take the analysis of sea-water, a mineral water of the widest distribution.

OCEAN WATER.					
Amounts assigned to hypothetical combinations			Amounts assigned to radicals		
Combinations	Milligrammes per litre	Grains per U.S. gallon	Radicals	Milligrammes per litre	
Sodium chloride (NaCl) ...	27,215	1868.0	Sodium (Na) ...	10,710	
Magnesium chloride (MgCl ₂)	3,807	220.0	Potassium (K)...	390	
Magnesium sulphate (MgSO ₄)	1,658	96.0	Magnesium (Mg)	1,300	
Calcium sulphate (CaSO ₄) ...	1,260	73.0	Calcium (Ca) ...	420	
Potassium sulphate (K ₂ SO ₄)...	863	50.0	Sulphate (SO ₄)...	2,700	
Magnesium bromide (MgBr ₂)	76	4.4	Chloride (Cl) ...	19,350	
Calcium carbonate (CaCO ₃)...	121	7.0	Bromide (Br) ...	60	
			Carbonate (CO ₃)	70	
Total ...	35,000	2058.4		35,000	

An ion is an atom or group of atoms, forming in itself a complete individual, and possessing a charge of electricity; they may be produced by the dissociation of larger electrically neutral molecules (that is, of the molecules of compounds as ordinarily expressed by their chemical formulæ) into smaller ones bearing, respectively, equivalent amounts of positive and negative electricity. In every solution the aggregate of charges on the positive ions which it contains must be exactly equalized

by the sum of the charges on the negative ions present, otherwise the solution as a whole could not be electrically neutral. There is, apparently, in solutions some specific power in the solvent by virtue of which it is able to so force itself in between the parts of the molecules as to separate them into ions. Different solvents vary greatly in the extent to which they possess this power, water ranking as the most powerful (*see* Talbot and Blanchard). Dr. R. Fortescue Fox presented this subject clearly in his Hyde Lectures before this Society in 1911¹:—

“In all medicinal springs no doubt much importance attaches to the form in which the ingredients are presented in a more or less dilute solution. It would even seem that very dilute waters are sometimes the most active. . . . Water has the power of fluidifying or rendering motile the majority of solids. The fluidification, as in the case of vaporization, is associated with a loosening of the mechanical and chemical structure of the particles. This process as applied to salts is described as dissociation. Water further has the property of taking up molecules produced in this manner between its own molecules, rendering them fluid and motile, dissolving them, and increasing their chemical activity.

“Moreover, these separated particles, or ions, whether bases or acids, carry a positive or negative electric charge and do not exhibit the usual properties of the free elements. In a solution of sodium chloride, for instance, completely ionized, neither the kathion (sodium) nor the anion (chlorine) exhibit the properties of these elements in the free state. It is noteworthy that the degree of ionization is in proportion to the dilution of the solution. In many medicinal waters it is supposed that saline constituents are in a state of complete ionization.”

We now have some insight into the remarkable effect of waters of low mineralization, and can understand why the free motility of the particles of matter may be essential to active metabolic processes as has been suggested. All waters carrying less than 150 parts per million of total mineral matter are considered “low,” over 500 parts “high,” and over 2,000 parts “very high.” Of course, low concentrations of powerful radicals like arsenic may be therapeutically very powerful, or even toxic. Once firmly established in the mind, the ionic form of expression stated in parts per million, or milligrammes per kilogramme, will be found the easiest to comprehend and to calculate, and in harmony with what we hope will be the universal methods of stating the composition of waters.

We are heartily in sympathy with the resolutions passed at the Third International Congress of Physiotherapy in 1910. Three of these

¹ *Proceedings*, 1911, iv, p. 107.

resolutions call for : The revision of analyses of mineral waters and the adoption of an international notation harmonious with modern chemical terms ; the study of an international system of classification of mineral waters ; the establishment in each country of a complete official descriptive catalogue of all springs and their commercial use ; the creation of an international committee on the scientific study of mineral waters.

The classification of mineral waters has been attempted by many men of many minds, but we believe we owe to Dr. A. C. Peale, of the Smithsonian Institution, Washington, the best and most comprehensive classification, first presented in a paper read before the American Climatological Association in 1887. He has classified all the mineral springs of the United States that have been analysed, and he has found it to meet the requirements in every case. All mineral waters are divided into two great groups, and are then treated precisely alike with reference to their chemical contents. Group A, *cold* (non-thermal) *springs*. Group B, *thermal springs*. A spring is "thermal" when its temperature is above the mean annual temperature of its locality ; it is "cold" when below that temperature. A spring, therefore, might be thermal in Alaska when a spring having an identical temperature would be cold in Virginia.

Class 1 : Alkaline (sulphated—borated—muriated).

Class 2 : Alkaline-saline (sulphated—borated—muriated).

Class 3 : Saline (sulphated—muriated).

Class 4 : Acid (sulphated—muriated—silicious).

Class 5 : Neutral or indifferent waters.

The existence or non-existence of gaseous contents may be shown thus : (a) Non-gaseous, (b) carbonated (containing CO_2), (c) sulphuretted (containing H_2S), (d) azotized (having nitrogen), (e) carburetted (having carburetted hydrogen) ; to the foregoing we must now add (f) radio-active waters.

Class 1 : Alkaline Waters.—These may be termed sodic-magnesian, alkaline, chalybeate or calcic. Alkalinity may be due to sodium, potassium, or lithium (primary alkalinity) ; or it may be due to the presence of alkaline earths, calcium and magnesium (secondary alkalinity). The term "primary," in this connexion, indicates an association with the alkalines of the oldest rock formations of which the alkalies are the principal soluble decomposition products. The alkalinity of waters due to contained calcium and magnesium is termed "secondary" because they occur in connexion with rocks of more recent or secondary (stratified or sedimentary) formation. Springs of this class commonly contain

carbonic acid gas, which increases palatability and solvent power; they also merge by gradation into the succeeding classes, alkaline-saline and saline. Some of the notable alkaline springs in the United States are: the Navajo spring at Manitou, Colorado; Ukiah Vichy, California, and California Seltzer; Waukesha Springs (White Rock and Clysmic), Wisconsin; Londonderry Spring, New Hampshire. These waters stimulate the action of the stomach and check acidity and fermentation; they increase the urine and lower its acidity, and have a good influence on the mucous membrane of the entire digestive tract. Hence they are used in the treatment of acid dyspepsia and flatulence. They are useful in chronic gastric catarrh with hyperchlorhydria, rheumatism and gout.

Diabetes was at one time supposed to be favourably influenced by the alkaline waters, and even still patients suffering from this complaint are commonly sent to La Bourboule, Vichy, or to Carlsbad. This mode of treatment arose from the view put forward by Maille that the disease was due to incomplete oxidation of sugar owing to lack of alkali in the blood. This doctrine has long passed away, but the practice founded on it still survives. Many patients are in reality much benefited by a course at Vichy, at Carlsbad, or at other spas, but there is every reason to believe that this is due not to the waters but to the careful régime and regulation of the diet. The alkaline salts have been shown by many observers to have no power to diminish the formation of sugar, while in all cases the copious administration of water is injurious. Unless alkalies are called for on some independent ground they should not be given in diabetes.¹ It used to be believed, and spring owners never failed to claim, that there were wonderful virtues in the lithium waters of this class. The advertised analyses showed as high as 22 gr. per gallon (379 parts per million) of carbonate of lithium in one case, and absolutely fictitious amounts in many cases. The United States Government has put a stop to this, and the word "lithia" does not now appear on so many American mineral water labels as formerly.² It is not proved that lithia has any therapeutic effect very different from its congeners, sodium and potassium.

The waters of Carlsbad in Austria, Fachingen in Germany, and Vichy in France are notable examples of the alkaline waters.

Calcic-magnesian Alkaline Waters.—The waters of secondary alkalinity, or those containing notable amounts of calcium and magnesium

¹ W. R. Huggard; see also Von Noorden, "New Aspects of Diabetes," E. B. Treat and Co., New York, 1912.

² See author's article on mineral springs, Hare's "Modern Treatment," Philad., 1911.

are commonly denominated calcareous waters. They contain a notable proportion of the alkaline earths belonging to the secondary geologic formations. The salts of calcium are sparingly soluble in water, and give it a characteristic usually termed "hardness." Waters of excessive hardness are entirely unsuitable for drinking, but this quality does not prevent their use for bathing. Most of the thermal springs of Virginia and West Virginia belong to this class, the strongest or hardest being used for the baths, and those of weaker character being used internally. The Warm Springs, Hot Springs and Healing Springs of Virginia are in the same valley, where limestone belonging to the Cambrian, Trenton and Hudson (Valley limestone) formations underlies the surface. These thermal springs range in temperature from 84° to 106° F., and have been used since the days of the American Revolution for bathing and internal use. The Healing Springs water, which is principally used internally, contains calcium bicarbonate as its principal mineral, analyses showing 356 parts per million (or 356 mg. per kilogramme) (20.7 gr. per gallon). Calcium sulphate is absent, and this is a great advantage, as indigestion and constipation are less likely to be caused. In this respect Healing Springs water bears a close resemblance to the waters of Wildungen. The waters used for bathing, those coming from the Boiler Spring at Hot Springs, are considered too hard for internal use.

One of the notable discoveries of the last century was made by Thomas Clark, of England, who, in 1841, patented a process for removing the objectionable constituents of hard water. He discovered that ordinary lime water precipitated the soluble calcium bicarbonate as calcium carbonate, and that all the calcium was removed simultaneously from the water so treated, and from the reagent as well. This process has been of immense value industrially and hygienically, and has been widely employed.¹

Ocean water contains an excessive amount of calcium and magnesium, not altogether dissociated from the chlorine, amounting in all to 420 parts per million for calcium and 1,300 parts for magnesium; the carbonate content in this case is 70, the chlorine content amounting to 19,350.

Calcic or calcareous waters when not associated with chlorine or the sulphate radical, have a beneficial effect in cases of gout and rheumatism and in counteracting hyperacidity of the stomach and urinary tracts. The calcium salts are excreted by the intestine in the form of a phosphate, and so the latter's transference to the kidneys

¹ See Chase Palmer, Bulletin 479, United States Geological Survey.

and urine is prevented. Von Noorden has shown that the total amount of phosphates in the urine is diminished, and as the reaction of the urine approaches alkalinity, the proportion of disodium to monosodium phosphates is modified in favour of the former. Most of the waters contain, in the natural state, carbonic acid gas, and therefore are best used at their source. Calcium salts are eagerly sought by the acids of imperfect digestion. The latter readily combine with the bases thus furnished, and probably in this manner obviate union with similar bases found in bone, cartilage of joints, and in other natural tissues of the body. A proper selection of food is usually enjoined at spas for treatment of rheumatism and gout, in which vegetables rich in salts are recommended, so that diet goes hand in hand with mineral waters in the treatment of these affections. Calcic and magnesian waters favourably influence rheumatism of a subacute or chronic type, pyelitis from kidney concretion, chronic gonorrhœa, and bronchial catarrh. They probably also favourably affect scrofulosis, rachitis and osteomalacia, as they supply the deficient salts. Very recently attention has again been called to the need of lime salts in the treatment of tuberculosis. It is claimed that lime starvation is characteristic of these cases and should be corrected by dietetic methods; in this connexion calcareous waters should have a prominent place.¹

There are valuable thermal calcareous springs in the mountains of Virginia, West Virginia, and Arkansas, some of them almost entirely free from sulphuretted hydrogen. There are valuable cold sulphuretted, calcic-magnesian, sulphated, alkaline-saline waters at Richfield and Sharon, New York. The waters of Bedford Springs, Pennsylvania, of Contrexéville, France, and Leuk, Switzerland, are non-gaseous calcic, sulphated waters.

Saline Waters.—This large and important class presents all gradations from the weaker alkaline salines to the strong brines. They may contain large quantities of hydrogen sulphide (H_2S) or carbon dioxide (CO_2). Like the alkaline waters, they may be referred to as having primary salinity (NaK) or secondary salinity due to the presence of the calcium and magnesium (earths) and the stronger acid radicals. The term “tertiary salinity” is used to represent acid waters in which the percentage values of the strong acids present are greater than those of the alkalis and earths. Well-known examples of saline waters are those of Mount Clemens, Michigan; Glen Springs, Saratoga Springs,

¹ See article by the late Dr. Ira Van Gieson, *Transactions National Association for the Study and Prevention of Tuberculosis*, Washington, 1912.

Clifton Springs, Westfield and Columbia Springs, New York ; Caledonia Springs, between Montreal and Ottawa, Canada ; Byron Springs, Eureka Springs, and Calistoga Springs, California. These show a large amount of chlorides and are therefore called "muriated salines." Another large division is called "sulphated saline" because of the predominance of the sulphate radical. They contain magnesium sulphate (Epsom salt) and sodium sulphate (Glauber's salt) or their respective radicals. Other bases, such as calcium and iron, are also commonly associated ; likewise large quantities of hydrogen sulphide. The salines have an important place therapeutically on account of their laxative or purgative properties. They have an immense commercial value, and although in the United States there are large numbers of these springs whose waters have been extensively sold for a hundred years, vast quantities from Europe are imported. It should be noted that in the Saratoga waters, for example, there is more lithium than in so-called lithia waters ; the preponderance of the sodium chloride, however, determines the character of Saratoga waters, such as Congress and Hathorn, as saline, and they are used accordingly. The chloride of magnesium in saline waters is a constituent of the "Mutterlauge" of salt works ; it is present in the Dead Sea and in the stronger brines of Michigan and New York. Potassium chloride and calcium chloride are of no great advantage, as such, when taken internally, although the former is credited with increasing the flow of bile and improving the appetite. It is doubtful if we can differentiate any effect from these lesser constituents when using waters in which other elements greatly preponderate.

The use of sodium chloride waters undoubtedly causes an increase in the flow of gastric juice, bile, pancreatic juice and intestinal fluid ; the appetite is usually increased and the whole digestive tract freshened.

There is little opportunity for intestinal putrefaction, fermentation, or auto-intoxication from the alimentary canal when these waters are faithfully and judiciously used. The chlorinated waters have some advantages over the sulphated waters, or bitter waters, in the case of thin persons whose portal circulatory system is supposed to be sluggish. They correct atonic dyspepsia, furred tongue, bad taste in the mouth, and, as noted, almost always improve the appetite. This is the secret of the great popularity of Saratoga Springs in the earlier days ; those who went there to drink the waters were well rewarded, and we trust that under the State's ownership we may see that spa restored to its former sphere of usefulness. The waters of French

Lick, Indiana, in their artificially concentrated form, are likewise purgative and depend on the presence of sulphates.

Saline waters have long been employed externally as baths for rheumatic and gouty affections; in connexion with carbon dioxide they are used very extensively for the treatment of cardiac diseases. The plan of treatment afforded at Nauheim, in Germany, where the brothers Schott met with remarkable success, has been adopted at other European spas and has been imitated with more or less success by artificial means. The great advantage which Nauheim has lies in the great quantity of flowing water containing carbonic acid gas in connexion with chlorides, and in the proximity of the salt works where a strong brine or "Mutterlauge" is available for use in baths. Last, but not least, the physicians of the place have developed a plan of treatment suited to a large number of patients presenting a group of symptoms of cardiac and circulatory disturbances. Constant experience in a given class of cases is a great aid in adapting the treatment to individual needs.

Schlemmer claims that too rapid hypochloruration and hyperchloruration (French terms for the effect produced by a diminution or excess of sodium chloride in the economy) occasion in the animal organism, besides other functional disturbances, cellular alterations which, in the first instance, are characterized by mucoid swelling of protoplasm; and, in the second case, by atrophic lesions affecting the nuclear substance. These two procedures, carried on with moderation so as to avoid too sudden variations of osmotic equilibrium, enable one to make comparative studies in the two cases of electrical conductivity of the effect of different poisons and the influence of various infections. Experiments seem to show that, in general, organic resistance is greatly lessened in animals previously supplied with an excess of chlorides, by reason of lesions due to an overload imposed on cells by the fact of a stimulation of dialysis and consequent mineral disintegration. Schlemmer believes that we can compare the experimental data from the case of lesions caused by treatment not sufficiently gradual with the observed bad results following improper use of saline waters. The inference is made that saline waters are unsuitable for tuberculous patients. Saline baths, in the opinion of some of the German observers (Keller, Schlemmer), ought to be used with caution in tuberculous cases, on the ground that they cause a more complete and intense combustion of the albuminoids in the system. They assume that saline waters used as baths increase the respiratory-urinary exchange for nitrogen and minerals and that as tuberculous patients already present in general

an increase of these metabolic processes, we ought to be cautious about adding to the tissue waste, otherwise the cure will be interrupted. They make an exception in the case of surgical tuberculosis. Their conclusion is that salt baths are contra-indicated in pulmonary tuberculosis.

In the case of inhalations of sulphurous waters or vapours which have had some vogue in France the criticism has been made by M. Gréhant and Dr. Zaleske that sulphuretted hydrogen combines with the iron of the hæmoglobin, forming a compound similar to the oxyhæmoglobin, and to that extent the hæmoglobin is lost to the organism ; however, sulphurous waters may be useful in lesions of scrofulous type. On the other hand, it is denied that hydrogen sulphide can combine with the iron of the hæmoglobin. The sulphur of sulphur waters is eliminated by the bronchial tubes according to Claude Bernard, where it is combined with the different elements of the organism ; but it is claimed that it does not act directly on the blood. I submitted this question to Dr. W. H. Howell, Professor of Physiology in Johns Hopkins University, and he corroborated the opinion that hydrogen sulphide when inhaled diminishes the respiratory capacity of the blood. Cazaux has called attention to the favourable clinical experience in the Pyrenees in the use of sulphur inhalations, practised there for a period extending over one hundred years. Dr. Albert Robin, also refuses to condemn sulphurous waters in this connexion and, incidentally, makes a plea for the rehabilitation of chalybeate waters in tuberculosis which have been under a ban for many years, having been originally condemned by Trousseau.

Iron, or Chalybeate Waters.—Iron is found very frequently in mineral waters and in all of the four principal classes : we may have an alkaline chalybeate ; an alkaline-saline sulphated chalybeate ; an alkaline saline muriated chalybeate, and an acid sulphated or muriated chalybeate. There are no absolutely pure chalybeate waters, but the iron exists in connexion with the bicarbonates, sulphates, chlorides, and with other metals such as calcium, magnesium and aluminum. They are thermal or non-thermal and are associated with free carbonic acid gas and hydrogen sulphide. A water containing bicarbonate of iron is usually preferable for continued use as a tonic to one holding sulphate of iron, as the latter is more astringent. Free sulphuric acid and alum salts render some iron springs unfit for use ; but where these constituents are in moderate quantity and may be taken at their source the effect is often beneficial. A relaxed mucous membrane with a tendency to diarrhoea and anæmia may be treated successfully with a water of this type. Good examples are Rockbridge alum water, Virginia, or the

Oak Orchard Springs, New York. For continued use in anæmia and chlorosis we naturally choose a water with bicarbonate of iron, from a cold spring with an abundance of carbonic acid gas.

Chalybeate waters always give the best results when taken from the spring. One reason why the iron waters do not act so well after bottling is that if much lime is present, as is frequently the case, the iron precipitates. The waters of Schwalbach, on that account, keep better than those of Pyrmont, which contain lime in abundance. Those from the Prince de Condé, Spa, keep the best of all and may be given in quantities from one to four tumblers a day. They aid digestion and improve the qualities of the blood. Iron waters are best taken after meals in quantities varying from 4 to 8 oz. The use of 8 oz. of the weaker waters may produce headache in susceptible patients. It is best to order a saline water before breakfast when giving iron waters. The waters of Franzensbad, Marienbad and Kissingen (Rakoczy) all contain some bicarbonate of iron and are bottled for use. Iron springs are rather common in the United States. One of the purest chalybeate springs gives the following analysis:—

“ROUND” SPRING, AURORA SPRINGS, MISSOURI, U.S.A.

				Parts per million		Grains per United States gallon
Ferrous carbonate	...	...	...	87·8	...	5·13
Ferrous oxide	...	...	...	15·9	...	0·93
Magnesium chloride	...	...	...	118·9	...	6·95
Sodium chloride	...	...	...	68·6	...	4·01
Calcium sulphate	...	...	...	41·4	...	2·42
Lithia	...	...	...	24·4	...	1·43

IRON SALTS.

			Parts per mil		Grains in one United States gal. of 231 cub. in.
Cresson Springs, Pennsylvania, iron spring	...	...	487·8	...	28·5
“ “ “ alum “	...	...	763·4	...	44·6
Mardela Spring, Maryland	...	...	196·8	...	11·5
Rock Enon Springs, Virginia	...	...	243·0	...	14·2
Massanetta, Virginia	...	...	53·0	...	3·1
Napa Soda Springs, California	...	...	135·2	...	7·9
Topeka Mineral Well, Kansas	...	...	481·0	...	28·0
Matchless Mineral Water, Alabama	...	...	17973·0	...	1050·0

Chalybeate waters are useful in anæmia, general debility and scrofula. The more astringent waters may be chosen in cases of chronic diarrhœa and in malarial cachexia. Iron waters are generally deemed unsuitable in any case of fever, in gastric irritability, and in pulmonary diseases if hæmorrhage is a feature. Like most mineral waters they are diuretic. If associated with a little arsenic or manganese their value is probably enhanced.

Arsenic Waters.—Waters of this class are found in the United States and Europe, the best known being as follows:—

					Parts per million	Grains of arsenic per gallon
Mont Dore, Puy de Dôme, France	...	...	...	...	1.19	0.7
La Bourboule	...	...	...	...	28.6	—
Levico, Austrian Tyrol (strong)	...	...	...	...	10.2	0.6
Roncegno	...	...	...	...	3.9	2.0
Crockett Arsenic Lithia Spring, Montgomery Co., Virginia...	...	...	...	...	2.4	0.140

These waters contain iron as sulphate. The small quantity of arsenic acid or arsenious salts is readily taken up in the blood-stream and increases the amount of hæmoglobin. Arsenic has an effect on the skin, which seems to be better nourished.

Gaseous Waters.—The presence of gases, such as nitrogen, carbon dioxide, or hydrogen sulphide, adds a distinctive character to mineral waters and sometimes suggests the name of the spring. It is a well-known fact that the estimation of gases in mineral waters is quite uncertain, varying more than in the analysis of solid contents by different chemists. Gases are, naturally, volatile and must be estimated at the spring, and even then the results vary greatly. The fact that waters are released from all pressure on their emergence at the springs determines the escape of much of the contained gas. This has led to some very interesting questions and, incidentally, to law suits. These hinged on the point whether a water was still natural when the original gas had escaped and when the contained gas, or other similar gas, had been recombined with the water under artificial pressure. It should be remembered that a given quantity of water—e.g., 1 litre of water at 15° C. and at the ordinary atmospheric pressure—can contain the same volume—1 litre—of carbonic acid gas; but to contain five times that bulk it must be subjected to a pressure of five atmospheres. In the case of hydrogen sulphide, at 15° C. and at atmospheric pressure, as much as 3.24 volumes can be contained. Heating, however, in all cases speedily reduces the percentage of gas contained, and hence it is that cold gaseous springs are usually more highly charged than hot gaseous springs. Practically all carbonated waters when bottled for sale are artificially charged.

We should endeavour to cultivate a rational use of mineral waters and a true knowledge of their contents and physiological action. The majority of people depend on the advertised analysis of waters and the statements of their owners, or their agents, regarding their action on the

system. Others rely upon personal experience at the fountain head or on physicians who have studied their effects. The empiric method and the scientific investigation should go hand in hand. The United States Government and the French Government, through the "Commission des Eaux Minérales" of the Académie de Médecine, have taken this matter in hand. For the past twenty years no mineral water can be advertised as such, nor can a mineral water station be exploited in France, without the favourable recommendation of the Commission under whose direction the analyses are made. Such a guarantee of accuracy has been lacking in the United States until recently. It needs only a glance at the United States Government report on lithia waters to see what absurd claims were made by mineral spring owners as to the amount of lithia contained, when the United States Government chemists showed that the lithia content in many cases was inappreciable.¹

Although there is a widespread belief in the specific action of mineral waters when used for bathing, there is no scientific basis for the supposition that any of the mineral contents are absorbed through the uninjured skin when the body is immersed. This subject is a large and important one and has been the subject of most careful observations in Germany and Austria.² The beneficial effect of mineral waters when externally used depends on the action on the peripheral nerves or end-organs of the skin and, by them, on the central nervous system; and on the thermic stimulus in connexion with the physical force used in the applications. The thermic stimulus is succeeded by a reaction which, in most cases, is brought about when the waters are properly applied. The body reacts to heat, or plus (hyperthermal) stimulations. We can thus heighten innervation, lower or abolish it at the point of application, or in the central organs, or by reflex processes in the most varied motor and vasomotor tracts. As Winternitz puts it: "Thermal stimulations are therefore indicated when innervation require to be strengthened, suspended or altered." He assigns in this class of effects the first place to the action of baths on the vasomotor centre. This is the key to the action of baths in fever.

Balneology includes not only the internal administration of waters

¹ Lately the United States Government has undertaken a thorough investigation of the chemical and medicinal properties of the waters of Hot Springs, Arkansas, where there are two Government hospitals and where the entire property, including the springs, belongs to the United States. This Commission, involving an outlay of \$50,000, will probably be authorized by the present Congress.

² See the author's "Hydrotherapy," W. B. Saunders Co., Philad., 1910, pp. 20-25.

but also baths in mineral springs. These uses of water are almost always associated, and different observers from time immemorial have attached different values to these two therapeutic methods. At most spas both modes are utilized. Their combination in a given case usually gives the best results. At resorts like Saratoga the internal use of the spring waters takes precedence, while at Mount Clemens, Michigan, White Sulphur Springs, West Virginia, and Nauheim in Germany, baths are chiefly relied upon. At Hot Springs, Virginia, French Lick, Indiana, Carlsbad, Austria, and Aix-les-Bains and Vichy in France, the combined method prevails. It is rather significant that in the three great resorts for the treatment of gout and rheumatism in the United States these afflictions have been treated with great success for many years with baths of widely different character. Take, for example, the analysis of waters at Hot Springs, Virginia, Hot Springs, Arkansas, and Mount Clemens, Michigan. The latter baths have over one thousand times as much solid contents as the Arkansas baths and eighty thousand times as much common salt. The Arkansas Springs have half as much calcium bicarbonate as the Virginia Hot Springs. Neither contain iron, while the Mount Clemens baths are rich in iron.

Analysis in parts per million; hypothetical combinations			Hot Springs, Arkansas; Big Iron Spring	Hot Springs, Virginia; Boiler Spring	Mount Clemens, Michigan; Park Baths
NH ₄ Cl	...	...	0.119	—	—
KCl	...	...	3.05	9.3	12500.0
NaCl	...	...	1.65	—	112482.0
MgCl ₂	...	...	—	—	25743.0
CaCl ₂	...	...	—	—	125800.0
Na ₂ SO ₄	...	...	10.06	63.0	—
K ₂ SO ₄	...	...	—	11.5	—
CaSO ₄	...	...	—	33.0	18103.0
MgSO ₄	...	...	1.30	146.0	—
MgBr	...	...	—	—	1176.0
NaBO ₃	...	...	1.98	—	—
Mg(HCO ₃) ₂	...	...	20.1	52.0	—
Ca(HCO ₃) ₂	...	...	190.0	397.0	—
Fe ₂ O ₃ ; Al ₂ O ₃	...	...	0.27	—	—
Fe ₂ O ₃	...	...	—	—	495.0
Mn(HCO ₃) ₂	...	...	1.09	—	—
SiO ₂	...	...	45.6	33.5	2490.0
Total solids	...	...	284.88	745.3	298789.0
Carbon dioxide	...	...	—	24.6	—
Hydrogen sulphide	...	...	—	—	—

The analysis of the Hot Springs, Arkansas, was made by J. K. Haywood, of the United States Department of Agriculture; of the Virginia Hot Springs by Dr. Henry Froeling; and of the Mount Clemens water by Samuel Duffield, of Detroit.

If we assume that approximately equal results are achieved by a course of bathing in waters so dissimilar, we cannot avoid the inference that the chemical constituents of these different springs are not *per se* the active therapeutic agents. That certain baths should be used with good results for a case of syphilis, and likewise for a case of gout, ought to suggest that the hydrotherapeutic or balneologic methods employed are more potent than the fact that the waters employed have a special chemical analysis. The differentiation of mineral springs for therapeutic purposes has some practical basis; but we believe it has been carried too far, especially in European practice.

During the last five years a method of using natural mineral waters hypodermically and intramuscularly has been developed in France. The late Dr. C. Fleig, of Montpellier, was an ardent advocate of the method and its chief exponent. Naturally a great many criticisms have been made of this procedure, but it is novel and worth looking to.¹ This author has tried sea-water in tuberculosis cases and later made a remarkable study of the effects of mineral springs by hypodermic method. This included the sodium chloride waters of Balaruc, Homburg and Nauheim; the arsenical waters of La Bourboule, which contain also considerable sodium chloride; the stronger sulphuretted saline waters of Uriage; those of Kreuznach (Victoria Quelle); Perrière. All the waters which had a molecular concentration approximating that of the blood were injected in their natural state. The Balaruc water, for example, is absolutely isotonic with the blood; that of Homburg (Elizabeth Quelle), Kreuznach (Victoria Quelle), Nauheim (Karlsbrunnen), and Uriage are a little hypertonic, but can be injected without any inconvenience undiluted. The water of La Bourboule (Choussy-Perrière) is sufficiently hypotonic to be injected in its natural state up to 200 or 300 c.c. For the higher doses it is desirable to raise it to the isotonic state by the addition of sodium chloride. Dr. Fleig, it appears, makes the injections intramuscularly or hypodermically, the quantity used varying from 20 to 100 c.c. daily, to 200 to 500 c.c. twice a week. The larger injections are given in the buttock; and likewise some of the smaller injections; but Fleig lays some stress on giving small injections near the local lesions, such as ulcerated glands and fistulous tracts leading to bone. He used also wet sterile dressings of the water to be employed. When there are superficial or deep granular lesions, he attempts to bring on a direct local reaction with the water employed by making the

¹ C. Fleig, "Les Eaux minérales, milieux vitaux. Sérothérapie artificielle et balnéothérapie tissulaire par leur injection dans l'organisme," Maloine, Par., 1909, pp. 513.

injection in the neighbourhood of the lesion. He also uses local injections of an ethereal solution of iodoform into the tuberculous glands, if such are present. Care is taken in using gaseous waters to get rid of the excess of gas by agitating in a large flask. The result to the patient is usually some reaction attended by chills, slight fever and sweats; they are not held to be toxic, but analogous to the symptoms produced by the larger injections of normal saline commonly employed. Fleig has used his method intravenously as well as in the manner described. The condition of the patients reported on and the results are stated with considerable detail and the outcome was favourable in most cases.

RADIO-ACTIVITY OF MINERAL WATERS.

Not long after the discovery of radium by the Curies in 1898, the mineral springs of France were tested for radio-activity. Mme. Curie, Moureu, Laborde and Bertier had done the principal work, and they report most of the French springs radio-active. In Germany those of Gastein, Karlsbad, Marienbad, Teplitz-Schonau, Fischau, Baden, Joachimsthal, Odenwald, Postyen, Wiesbaden and Kissingen are all pronounced radio-active by such observers as Mache, Meyer, Schmidt and Kurz, Jentzch and Heinrich. Ten years ago the waters of Bath, England, were shown to be radio-active by The Hon. R. J. Strutt,¹ and the same characteristic is possessed by Buxton. In the United States the chemists of the Geological Survey, Schlundt and Moore, have studied very thoroughly the mineral Springs in Yellowstone National Park, and find the waters and gases in a very large number radio-active—far greater, as a rule, in this respect than any of the European springs.

Professor B. B. Boltwood and Dr. J. H. Pratt, of Yale, have examined the Hot Springs of Arkansas, and found forty-four of these springs radio-active. The measurements are all given in Dr. Boltwood's report, and he notes that the activity of the gas fell to half value in three to nine days after removal from the source.² These studies were made with Dr. Joseph H. Pratt at the direction of the Secretary of the Interior. The methods employed in determining the radio-active gas in water and the presence of radium salts in solution was by expressing the activity of the dissolved radium emanation in terms of the uranium equivalent, since the quantity of radium associated with a definite weight

¹ *Proc. Roy. Soc. Lond.*, 1904, lxxiii, pp. 191-97.

² *Amer. Journ. of Science*, New Haven, 1905, 4th ser., xx, p. 128.

of uranium in a radio-active mineral has been shown to be perfectly definite and of unvarying quantity; this method of expressing the activity of a given quantity of emanation, as Dr. Boltwood shows, affords a correct and accurate standard for the comparison of samples of water from different sources. The same method and the same type of electroscope designed by Dr. Boltwood were used by Schlundt and Moore in the Yellowstone National Park in 1906.

All the springs of Hot Springs, Arkansas, are situated in a portion of a narrow valley about 500 yards long; they range in temperature from 35° to 64° C. (95° to 147° F.), and the total solids range from 170 to 310 parts per million, a rather low mineralization. The radio-activity, however, did not show any corresponding uniformity; the most active spring water showing over 500 times more than the least active. This was shown to be wholly independent of the method of collection and examination; neither did there seem to be any connexion with the temperature, flow, location, or chemical composition of the waters of the spring, and the observed differences in their radio-active properties. The second most radio-active water was found in one of the few cold springs on the reservation, and this seems to show that the thermal qualities of these waters and their radio-active qualities are due to quite independent causes.

There are different units of measurement of radio-activity which need some explanation. Curie, Laborde and Moureu took as a unit of the quantity of emanation the milligramme-minute of bromide of radium; that is to say, of emanation discharged during one minute by a milligramme of pure bromide of radium in solution. This unit is independent of measuring instruments, and is constant. It is called a "millicurie." A "curie" would therefore represent the action of 1 grm. of radium for one minute. The electrostatic unit is defined as being equal to the fall of tension, electroscopically, of 1 volt per hour, and by a litre of radio-active water. It varies necessarily with the electroscope employed, and depends on the capacity of the instrument. It would appear that 116 units or volts equal one Maché unit, and 7,000 volts equal 1 milligramme-minute unit of Curie. These relations seem at present to be generally accepted, but a uniform system ought certainly to be adopted to prevent confusion. The Radiological Congress at Brussels in 1911 formally adopted, at the suggestion of Löwenthal, the Curie unit.

One phase of this subject, now assuming practical importance, is the best means of rendering water radio-active for therapeutic purposes.

Two forms of apparatus have been utilized to some extent in Europe: One is of German origin and is manufactured by the Radiogen-Gesellschaft, of Charlottenburg, Berlin; the other is French and is known as the apparatus Armet de Lisle. In the German apparatus water is made to pass through a radio-active substance; in the French apparatus the water receives its properties directly from a small quantity of insoluble sulphate of radium placed in a small cup of spun glass in a portion of the glass apparatus designed to receive the water to be treated. The radiogen apparatus yields a radio-activity in the neighbourhood of 3,500 to 4,400 volts; it is claimed by Jaboin and Beaudoin that the apparatus Armet de Lisle gives 11,000 to 13,000 volts, and that it is preferable because it renders the substances treated indefinitely radio-active. Of course, we have not been able to verify these claims.

Another method of rendering water radio-active has been invented by Dr. Hugo Lieber, of New York. His device consists in dissolving radium bromide in a suitable solvent and then applying this to the inside of a celluloid cylinder and coating it with collodion for protection against loss. Tubes prepared in this manner and closed with rubber stoppers provided with stopcocks permit the alpha radiations to pass into the calibre of the tube without restraint and thus fill the cylinder with radium emanation. After allowing the emanation to collect for twenty-four hours it is then a simple matter by rubber bulbs to force this emanation gently into a column of water. The details of this process were fully described by Dr. Lieber nearly ten years ago, and are now commercially available. In a similar way rods are coated with radium for surgical purposes. Water rendered radio-active in this manner loses this property very soon, and hence must be used as quickly as possible.¹ Another valuable method of using radium is by mixing it with gelatine for use in injections, and for applying it to the cavities of the body. This also has been devised and perfected by Dr. Lieber.

Radio-active water may also be made by placing pitchblende in a jar of water or suspending it in a coated tube or rod prepared in the manner above mentioned.

From Bertier's observations radio-activity at Aix-les-Bains diminishes very rapidly from the moment of preparation of the bath. The mere fact of adding cold water and stirring the water of the bath is sufficient to lower the radio-activity of the thermal water 50 per cent.; sub-

¹ Hugo Lieber, Ph.D., *Journal of the Franklin Institute*, Philad., December, 1911.

sequently the radio-activity is lowered more slowly. The following measurements are in millicuries:—

Radio-activity of the water as it emerges in tubs (temperature 40° C.)	...	0·62
„ „ at 36° C.	... ..	0·31
„ „ after ten minutes	... ..	0·25
„ „ „ twenty minutes	... ..	0·20
„ „ in large pool (sulphur water).		

The radio-activity of a current of thermal water flowing in the bath is maintained at 0·34. In the pool, which has a large surface exposed, in spite of the large current of sulphur water which continues to flow in, the radio-activity is lowered to 0·157, the temperature remaining at 38·5° C. (101° F.). Consequently, to obtain the highest radio-activity, it is necessary to use the thermal waters on their emergence. Hence, it is believed that the douche at Aix owes some of its virtues to the presence of radio-activity in the somewhat prolonged use, a prominent feature of the treatment at that spa. The pools are used for the re-education of movements and the relief of traumatic ankyloses.

In ten minutes' use of the douche Dr. Bertier estimates that about 500 litres of thermal water are used under variable pressures. The air is also saturated with radio-active emanation, and is inhaled by the patient, and this is held to be an important therapeutic aid. Bertier measured the radio-activity of this air contained in the Berthollets, or small cabins, and finds it 0·16. He does not overlook the value of the heat and humidity, however, as playing an important part in the cure. There is also found on the walls, and in other places exposed to the waters, a substance called "barégine." It is composed of vegetable matter and gives a peculiar feeling to the water, facilitating massage. This dries, when exposed to light and air, in the shape of flakes, and it also retains a certain amount of radio-activity, estimated at 0·09. The "barégine" can be collected in considerable quantity at the end of the bathing season in all the bath-rooms, but it is not employed therapeutically.

Returning now to the Yellowstone National Park, we find there about 4,000 thermal springs and about 100 geysers. Nowhere on the globe is such a marvellous group of mineral springs. One of the interesting features of Schlundt and Moore's studies was the discovery of thorium emanation in sixteen of the eighty-two gas sources examined. The thorium is associated with the radium emanation, and it is the first

place on the American continent where thorium emanation has been found. It was found, in one instance, to have an initial activity fifteen times greater than that due to the radium emanation in the same gas.¹ Pitchblende yielding radium has been found in Gilpin County, Colorado, and carnotite, which yields uranium in considerable amount, is also found in that State and in Arizona.

Dr. BUCKLEY said that the thanks of the Section were due to Dr. Hinsdale for bringing before them observations of so much value in the study of mineral waters. He thought that the observations on the radio-activity of the waters of Aix-les-Bains were of considerable importance; they clearly showed that the radio-activity of any mineral water from a practical point of view must not be judged on the maximum figures given for the spring, but allowance must be made for the loss which so rapidly occurred as the water cooled to the temperature at which it was possible to use it. In falling 4° C. the Aix water lost half its radio-activity. A mineral water which was too hot to drink on its emergence from the spring, as for instance that of Bath, probably lost radio-activity to an equal extent before being drunk by the patient. The cooler or cold mineral waters of this type would obviously not be affected by this rapid loss if they were taken by the patient fairly quickly rather than sipped. So far as he had been able to observe, however, the effects of treatment by radio-active mineral waters showed no relation to the strength of the water in radium emanation. For instance, he did not think that anyone would claim that the results of treatment at Gastein or Joachimsthal, where the strength of the water in this respect was many times greater than that of either Bath or Buxton, were better to that extent, if at all, than those obtained at the English spas. Equally it was the case that artificial radium waters, whose strength might be hundreds of times more than that of any radio-active mineral water, showed no proportionate advantage in actual use so far as his own observations had gone. What then was the explanation? It lay, he believed, in the degree of ionization of the mineral constituents of the water. It had been pointed out that the degree of ionization was in proportion to the dilution of the solution, and he believed that it was the case that the degree of ionization was much greater in the presence of the emanation of radium, though not necessarily in proportion to the amount of the emanation present. He believed that the explanation of the remarkable effects of the waters of low mineralization lay in this peculiarity and not in the degree of radio-activity they possessed, and this would explain why the artificial radium waters failed to produce the effects of the radio-active mineral waters, which they could hardly fail to do if radium emanation itself were the chief source of therapeutic activity.

¹ Herman Schlundt and R. B. Moore, "Radio-activity of the Thermal Waters of the Yellowstone National Park," Bulletin 395, United States Geological Survey, Washington, 1909.

Balneological and Climatological Section.

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Dr. F. A. DE T. MOUILLOT, President of the Section, in the Chair.

London as a Health Resort and as a Sanitary City.

By S. D. CLIPPINGDALE, M.D.

THE paper I am about to read to you differs widely from those usually read before this Section. There will be an absence from it of those scientific data and theories which commonly illumine those papers and from them it will be a sort of *divertissement*. Its object is, first, to proclaim the salubrity of London and then to indicate the suitability of London for certain maladies, chiefly of a psychopathic or neuropathic nature.

(I) THE SALUBRITY OF LONDON.

London has been called the healthiest, and with the exception of Madrid, the ugliest city in the world. It is, I hope, fully maintaining the former character and rapidly losing the latter. The vital statistics of London are well known. It will suffice here to state that the general mortality from all causes is 14.2 per 1,000 per annum, a ratio which compares favourably with other large towns, while the death-rate at Hampstead, one of the healthiest of London suburbs, is the lowest in the country [19]. The healthiness of London is no new thing. Writing in the twelfth century, Fitz-Stephen becomes ecstatic as to the sanitary state of London and attributes this to the excellence of the town's water supply, which at that time came from certain springs lying to the north of the town. Three centuries later Sir Thomas More selected London as the seat of his ideal Utopia [22].

London has always been fortunate in its water supply. When the springs mentioned by Fitz-Stephen could no longer be used, an altruistic abbot of Westminster allowed the City Corporation to take as much water as it required from certain springs belonging to him at Tyburn, the water being conveyed into the city by pipes. The rent charged by this abbot for this unlimited supply of water was one peppercorn a year, an act of philanthropy which has not been maintained until the present day. The supply from Tyburn lasted until the time of James I, when Sir Hugh Myddelton constructed the New River, which brought fresh and sweet water from springs in Hertfordshire. It has to be regretted that an enterprise so magnificent and so beneficent ruined its projector and proprietor. Sir Hugh Myddelton ended his days in bankruptcy, but the water supply provided by him is still used, though, on account of the growth of London, it is supplemented by water taken from the upper parts of the Lea and the upper reaches of the Thames.

The drainage of London has of course varied with the period. Mediæval London suffered from mediæval drainage, and the condition of things in London a few centuries ago has been graphically described by Dr. Tripe [20] and by Dr. Poore [18], though Dr. Creighton [7] thinks matters were better than has been supposed. By the end of the sixteenth century the drainage had become fairly satisfactory, as the City Corporation had by that time established its Commissioners of Sewers, whose duty it was to cleanse the sewers and to purify the watercourses.

Prosperous places, like prosperous people, are subject to libel. The favourite libel with regard to London is that a native London family is not heard of after the third generation. I am a member of the twelfth generation of a family living in London since the days of Queen Elizabeth, although our survival is probably due to healthy occupation, for, until quite recently, my forbears, in one capacity or another, found their bread upon the living waters of the Thames.

Having referred to Queen Elizabeth, let me point out what that autocratic monarch did for the health of the Metropolis. Alarmed at the increase in population, she ordered that no new house should be built within three miles of the city, and to arrest overcrowding she further ordered that no house should contain more than one family. Similarly, her equally autocratic father, in order to stay the spread of infectious disease, ordered that a white wand should be put from the window of every house containing a case of contagious nature, thus informing

not only the authorities but the neighbours also—a plan which had an advantage over the secret notification to the central authorities of the present day. Henry VIII also ordered the clothes of infectious patients to be taken out to the fields and burned. Among the other beneficent acts of this monarch was the prohibition of slaughter-houses within the city walls. These acts on the part of these monarchs were no doubt instigated by the medical advisers of these monarchs (Dr. Hicks in the case of Queen Elizabeth, and either Sir William Buttes or Dr. Linacre in the case of Henry VIII); but the curious point is that these acts were performed by a simple order in Council—a mere scratch of the pen. It would be interesting to speculate, how long, in these democratic days, such salutary laws would take to pass the Legislature.

The beneficent rule of the Tudors in matters of hygiene was continued by the Stuarts. Alarmed at the suppression, by the Puritans, of healthy recreation, James I issued what was called the “Book of Sports” [2]. This was an edict advising the people, on Sunday, after morning service, to go into the fields for athletic exercises, a list of lawful exercises being given in the “book.” Charles I re-enacted this provision. There can be little doubt that these athletic exercises on Sunday afternoon (in the absence of bank holidays and early closing days) did much to improve the health of the people.

The healthiness of London is largely due to its situation and to its soil. Placed only forty miles from the east coast with no high land intervening, London receives air straight from the North Pole, where it has been purified by contact with the ice and drawn south by the vacuum created in the aquatic region. With regard to the soil, the Thames, as is well known, lies in a basin of clay, but a clay basin, if turned upside down, is quickly drained. This is the case with London, and its healthiest townships are those placed on the north and south rims of the basin: Hampstead, Highgate, Harrow and other places, in the north; Wimbledon, Streatham, Sydenham and other places in the south. The soil found near or next the watercourse is invariably gravel and the places which lie upon it are less healthy. This is contrary to popular belief, but a reference to a geological map and to the Registrar-General’s statistics proves this to be the case, as I showed in a paper I read before the old Balneological Society [5].

The natural advantages of London are much enhanced by the large number of open spaces in its midst. The number of these spaces under the control of the County Council is 103, with an area of 5,000 acres;

which compares favourably with Paris, which has only 540 acres, and with Berlin, which has only 1,222 acres in a corresponding area. In addition to the open spaces under the control of the County Council, there are what are known as the "Royal Parks"—Regent's Park, Hyde Park, St. James's Park and the Green Park, with an area of about 1,000 acres. Then there are a large number of private squares, such as Cavendish Square, Portman Square, Belgrave Square, Eaton Square, and many others. Within the City itself the Corporation is converting into rest spaces the numerous small burial-grounds of the old City churches, while around London are vast open spaces such as Epping and Hainault Forests, Wanstead Flats, Hampstead Heath, Wormwood Scrubbs, Richmond Park, Wimbledon Common, and Blackheath, all of which contribute to the healthiness of the town.

London is too old a city to be amenable to any system of town planning, but the authorities are doing what is possible to give effect to the ideas of that right honourable gentleman, the President of the Local Government Board. London has grown in concentric layers around the civic centre and has not been built upon the chess-board principles of a modern town.

With regard to epidemic diseases, London, of course, has had to take its share. The "black death" of the fourteenth century, the "sweating sickness" of the fifteenth and sixteenth centuries, and the "plague" of the seventeenth century all produced great mortality. But the mortality in London does not appear to have been out of proportion to the size of the town. The relative mortality of the "black death" and the "sweating sickness" is unascertainable, but with regard to the Great Plague of 1665-66, the mortality in London does not seem to have been above, perhaps rather below, the average. One-third of the population was swept away; but the town of Birmingham was nearly exterminated, and according to Creighton [7] the relative mortality in Colchester and Southampton was greater than in London, while in the little Derbyshire village of Eyam, well known to our Buxton colleagues, five-sixths of the population succumbed. London has to confess to an endemic disease, but that has practically disappeared. There was formerly a malarial affection, very prevalent in the metropolis and known as "London ague." There can be little doubt that this was the ague that certain notable persons suffered from—Oliver Cromwell, Charles II, William III, and Queen Anne. In the old *Journal of Balneology* there were many original articles of great value. One of them, by our colleague Dr. William

Ewart [10], "On the Disappearance of Ague and Aguish Affections from London," contains practically all that is known of this bygone disease. In a paper I read upon the "Rivers of London" before the West London Medical Society, I suggested that the disappearance of "London ague" might be due to the closing in of many little streams that formerly intersected London [6].

With regard to the climate of London there is nothing to boast of or to defend. Situated in a "temperate" zone its climatic conditions are temperate. There are no near mountainous ridges, therefore the rainfall is moderate. The average is 22 in., as against 34 in. for the whole country. The average temperature is 56° F. The daily variation, however, is great, about 12°, and renders London unsuitable for respiratory affections. London fog is a matter which it would have been more difficult to deal with formerly than at the present time, for, largely due to the use of gas stoves, this peculiar attribute of London seems to be departing. Dr. Ewart [11], in his report in 1902 to the Royal Medical and Chirurgical Society, expresses his belief that London fog is disappearing, and his belief appears to be well justified. We have had no fog this season and very little for some years past. The well-known density of former London fogs is well remembered and people used to come from foreign countries to witness the curious phenomena. Evelyn, the diarist [8], describes a London fog in the year 1699 which must have been particularly dense. Evelyn also wrote a book dealing with London fog, suggesting means of dealing with it [9]. This book he dedicates to the King (Charles II), and in the fulsome manner of those times he tells the King that he had been induced to write the book because, on account of the fog, he and other loyal subjects, when in the park, had been unable to see "your Majesty's handsome face." The kind of fog which induced Hood to write his numerous poems has long since disappeared. Luttrell [16], a contemporary of Hood, in his letters to his *fiancée*, also complains of the fog and suggests that London chimneys should be taught to chew their own cud. Luke Howard [14] describes especially dense fogs occurring in the years 1813, 1817, 1821 and 1826; and the late Lady Dorothy Nevill [17], in the charming autobiography she gave to the world in her ninetieth year, describes the dense fogs which occurred when she was a child. But fog may not be so detrimental as supposed. Fog is not an atmosphere of poisonous microbes. It is an atmosphere charged with carbon, and carbon is antiseptic rather than septic. Although carbon is irritating to the mucous membranes, the

carbonic acid formed by it has a soothing effect upon the sensorium, and it is said that the late Dr. Blasius Williams found that if, while country patients, suffering from asthma, were waiting in London to consult him, a fog occurred, the fog relieved their asthma and they went back to the country without visiting him. But the vagaries of the London climate may perhaps be screened behind the humorous apology of Captain Charles Morris, who writes:—

“ In town we’ve no use for the skies overhead,
For when the Sun rises we *then* go to bed ;
And as for that old-fashioned virgin, the Moon,
She shines out of season, like satin in June.”

What London wants badly is a reduction in the amount of soot and dirt, which amounts to something like 51,000 tons annually. But whether we shall ever be able to realize the “London of the Future” as dreamed of by Sir Aston Webb [21] will depend upon our capacity and ability to give effect to the views of that distinguished man and others like him.

There are London enthusiasts who declare that it is never necessary to leave London for health’s sake. The ordinary business man, say they, remains in his office for eleven months of the year, then takes a month’s holiday, the first few days of which are sufficient to restore his health ; the rest is superfluous. He then returns to business and does the work of the colleague who enabled him to get away—the result being that the first few days in double harness undoes the good he has received. It is probably, therefore, better for him to take his remedy *pro re nata*, that is, to get week-ends off or to live in the suburbs. But, upon this matter, our humorist mentioned above, in his fondness of London, has this couplet:—

“ If I must have a villa in summer to dwell,
Oh, give me the sweet, shady side of Pall Mall.”

The annual autumn exodus from London is a comparatively modern invention. It became necessary through the great strain caused by what is known as the “London Season,” and the “London Season” only came into vogue when the country had settled down after the suppression of the Jacobite rising of 1745.

(II) CASES SUITABLE FOR LONDON TREATMENT.

We have in London no natural baths, no mineral springs,¹ and no sea-shore; therefore we cannot invite patients requiring balneo-therapeutic, hydro-therapeutic, or thalasso-therapeutic treatment. It is possible that persons suffering from rheumatism will find relief from dwelling upon the well-drained soil of the Metropolis. It is also possible that persons subject to bronchitis will find protection from the streets of London. Asthma is relatively uncommon in London, as stated by Hirsch [13] and others; and the variety called by Adams [1] "place asthma" would probably be suitable for London, especially in those cases where the distressing spasm is largely a neurosis; another malady of the same kind, and amenable to the same treatment so far as its neurotic element is concerned, is whooping-cough. With regard to whooping-cough, allow me to make another reference to my own family. My grandfather was one of the pilots to the East India Company, and in order to be near the Company's vessels, he built himself a house at Blackwall—at that time a bracing place open to the estuary of the Thames. When his children suffered from whooping-cough, he found that the spasmodic cough was always relieved by sending them into the denser part of London. Hay fever is another malady which does well in London by removing the patient as far as possible from the source of his trouble. But in all these cases London has no advantage over large towns. It is in cases of a psychopathic or neuropathic nature that London, on account of its great size and its many divisions, finds its *métier* by its influence upon the mind.

It has been said that all persons are mad upon some subject, and I take it, with regard to place of residence, that all may be said to suffer from one of two forms of mild insanity—*agoraphobia*—a dread of open spaces—e.g., the country; or *claustrophobia*, a dread of closed places—e.g., a town. For the latter, residence in London or in any large town is, of course, inimical; for the former it is essential.

London life is to some people their *pabulum vitæ*—the material upon which they live. This has been markedly shown in the cases of certain men of great mental activity. "The air seems dead in this quiet country" (says Meredith), "I must rush up to London to live." "Sir," said Dr. Johnson [3], when asked to accompany a friend for a

¹ There were formerly a large number of medicinal springs in London: Bagnigge Wells, Sadler's Wells, Clerkenwell, Shadwell, and others, but these have been disused.

walk in the fields, "when you have seen one green field, you have seen all green fields; I prefer looking on men and things—come, let's take a walk down Fleet Street." Johnson was born in Lichfield, and he was fond of visiting his native place; but he always said he felt more at home in London. To him the *οἱ πολλοί*, . . . the motley throng, of the great Metropolis, was more congenial than *οἱ πάντες*, the restricted circle, of the small cathedral town. It may, perhaps, be fairly assumed that the output of his great brain would have been restricted had he lived anywhere but in London. Another lover of London and of Fleet Street was Charles Lamb, who writes: "I am naturally inclined to hypochondria, but in London it vanishes, as do other ills. The man must have a rare receipt for melancholy who can feel dull in Fleet Street." Fleet Street does not appear to be at the present day a very attractive place, but among literary men it has been known as the "blue matter of the world's cerebrum" [15]. No, wonder, then, that men like Johnson and Lamb like it.

This fondness for London is not the special attribute of great men, and Londonophilia has shown itself in an extraordinary way in silly people. A wit of the Georgian period had the roadway in front of his country house paved with cobble-stones, in order that he might hear the rattling of carts over them and so be reminded of London. Ford Maddox Hueffer [15] has recorded the case of a Londoner dying at a distance who expressed his regret that he was not passing away in the Underground Railway; and Pett Ridge has told us of the servant girl who, leaving London with her family, leaped from the carriage to kiss the last stone of the city. But if London has its lovers, it also has its haters, and among the Londonophobists are those whose opinion is worthy of every respect. The depth of their antipathy to the place may, perhaps, be measured by the number of the epithets they use. Heine contents himself with two, calling London the city of "fog" and "porter"; Grant Allen uses five: "seething," "grimy," "opulent," "squalid," and "hungry"; and Ruskin employs six epithets: "foul," "rattling," "growling," "smoking," "stinking," "ghastly." But whatever may be its æsthetic attributes, there can be little doubt as to its suitability for persons suffering from certain nervous dyscrasias; cases, not of true pathology, but of simple digression from normal physiology; cases of hypochondria, melancholia, insomnia, and neuralgia of non-organic origin, the drug and alcoholic habits, and morbid introspection; cases, in fact, requiring the very opposite of a "rest cure." To send such cases into a "home" for special treatment is, to my mind,

acquiescing in the patient's own belief that he is the subject of some actual disease, and treating one imposition by another. To treat such cases by "hypnotic suggestion" and such-like means is, I believe (and I am alone responsible for my own opinions), degrading alike to the patient and to the practitioner; for the patient, to be amenable to such treatment must lose a certain amount of self-control, and the practitioner a certain amount of self-respect. Sir David Ferrier [12] has recently pleaded for what he styles "rational psychotherapy" in such cases; and by "rational psychotherapy" I understand such means as are provided by the diversions of this great city. Its historic, artistic, and literary associations; its many picture galleries and museums, its numerous places of amusement, the business activity of the city, the Attic regions of Belgravia, and the Alsatian retreats of the East End all combine to produce a state of exhilaration not met with elsewhere. In fact, it has been jocosely remarked that if Londoners themselves fell into a state of lethargy nothing would arouse them from it unless it were two Parliamentary elections in one year, together with an earthquake in the Strand.

In addition to submitting your patient to the internal diversions of London, send him for a tour round the City. Let him stand upon the Tower Bridge and contemplate the mercantile and pleasure craft passing beneath him; and let him think of the scene three centuries ago when Elizabeth's ships left that spot to meet the Armada. When—

"From all the batteries of the Tower pealed forth the voice of fear,
And all the thousand masts of Thames sent back a roaring cheer!"

(Macaulay.)

Let your patient pass into the East End and study the costumes and customs of Whitechapel. Let him get into the heart of the City, and exercise his ingenuity in crossing scatheless its crowded roadways. Let him pass westwards to the haunts of Johnson and Goldsmith, and Garrick and Lamb. Let him listen to the chimes of Bow Bells, and to the Bells of St. Clement's and St. Martin's, and be reminded of his nursery days; and at night send him to the Thames Embankment to see the homeless getting a night's lodging there.

If a few days in London does your neurasthenic patient no good, his case may well be helpless and hopeless.

In conclusion, Mr. President and gentlemen, let me commend to you the prescription of a noted Londonist, Horace Walpole, who writes: "Were I a physician, I could prescribe nothing but—'Recipe: CCCLXV drach. Londin. per annum'" (365 doses of London a year).

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DISCUSSION.

Dr. SEPTIMUS SUNDERLAND said he had frequently noticed that a short sojourn in London, with its myriad attractions, was of immense value, quite apart from medical treatment, to country dwellers suffering from various chronic maladies which depressed their vitality and spirits. For these same country people London could be considered a health resort also in another sense, because nearly every equipment useful in the treatment of chronic ailments and diseases could be found there. On their return to the country such patients often retained pleasing recollections of their stay in town and were furnished with subjects for conversation which diverted their thoughts and kept them for a time from brooding over their ailments, and materially assisted in improving their mental attitude and outlook on life, whilst their bodily condition also might have been improved by treatment. He referred to the difference, from a climatic point of view, of the various localities in and around London, mentioned some of the old wells of London, and referred to the spas and bathing establishments which had flourished in the town and its environs in the seventeenth, eighteenth, and early part of the nineteenth century.

Dr. PERCY LEWIS said that the properties of London as a health resort were founded on a fallacy. In the poorer parts it was impossible to find a family which had resided there for three generations. Also the low death-rate was due to rich people going into the country, where they swelled the local death-rate and proportionately reduced the apparent death-rate of London. This information was to be found in a paper published by Dr. William Freeman, of Andover, who spent much time and energy in collecting these facts.

Dr. FORTESCUE FOX pointed out that it was now just one hundred years since Luke Howard, in his classical work on "The Climate of London," laid the foundations of exact meteorology, derived from observations which were continued for many years near Tottenham. Howard was the first to point out that the singular variableness of the English climate was due to its participation by turns "in the Polar and tropical atmospheres" between which the country was situated. He held that the vigour of the British people was due to the comparatively cold climate, and that their mental energy was kept alive by its incessant changes. Howard also pointed out the frequent occurrence of dangerous weather from the rapid changes of temperature in the London winters, and that English people made insufficient provision against the weather and so suffered more from cold than the inhabitants of higher latitudes. It might be said, Dr. Fox continued, that there were three necessary elements in every true health resort. According to the Latin poet, "Cælum non animum mutant qui trans mare currunt." In all true health resorts it was necessary to find change, not only of the sky but for the mind. The third element was, however, essential—namely, some systematic treatment, usually hydrological, for the health-seeker. It was not possible at the present time for either the

climatologist or the hydrologist to say of the other, "I have no need of thee." Still less was it possible for the physician who believed in the mental treatment of disease to dismiss the proved effects of climates and of baths. The three elements were harmonious and mutually helpful in every true health resort. In regard to London, few would deny that it offered, both in summer and winter, climatic conditions favourable to health. It also offered ample and varied provision for the mind. What many persons sought in travel could be found more easily and with less fatigue in London, and he agreed with Dr. Clippingdale that there were a large number of persons, psychopathic and neuropathic cases in particular, for whom ordinary rest cures were attended with grave disadvantages, and for whom the wholesome distractions and interests of a great and ancient city like London might be prescribed with much advantage. Every taste and temperament and hobby could be occupied and provided for. London, however, still needed, in order to fulfil the third requirement of a health resort, a worthy and adequate Institute of Hydrology. In most of the other European capitals there were great institutions where hydrological treatment was both practised and taught by physicians who had devoted themselves to this branch of treatment. In England, on the whole, bath treatments were more needed than in warmer countries, both in summer and in winter (in very ancient days they were used throughout the country), and he had no doubt that there would some day be erected in London a central institution of this kind, worthy of the City and of British medicine.

Dr. L. C. E. CALTHROP said that Dr. Clippingdale had incidentally mentioned the beneficial effect of London air in cases of asthma; a case had come under his own notice in which the patient had found most relief from his asthmatic attacks when travelling on the old underground railway between Baker Street and King's Cross, which was noted for its bad ventilation. Dr. Sunderland had enumerated several interesting old wells and springs of London, but had not mentioned the fact that there existed in a little court off the Strand leading to the Savoy Chapel an old Roman bath; recently, too, as reported in the *Times*, evidences of another Roman bath were discovered in the City near the Tower in examining the foundations of a building which had been pulled down, showing that the Romans had probably been the earliest to establish baths in London.

Balneological and Climatological Section.

March 5, 1914.

Dr. F. A. DE T. MOUILLOT, President of the Section, in the Chair.

The Production of Osteophytes and Exostoses in Chronic Gout and Arthritis Deformans.

By J. BARNES BURT, M.D.

A STUDY of this question is interesting not only from the academic but also from the practical point of view, for the true explanation of how these changes are produced will do much to clear up the difficulties in the nomenclature of the chronic arthritic diseases. Considering the importance of the subject, the small amount of attention devoted to it by English writers is surprising. With the exception of Sir Dyce Duckworth, they have been content to quote very briefly the theories of Ranvier and Lane. From their works it would appear that the osteophyte is the product of a specific disease, osteo-arthritis, as if one special type of inflammation only led to this change. In order to account for the osteophytes in gout or injured joints it is suggested that osteo-arthritis has been grafted on to a joint already damaged by gout or trauma. There are four main theories as to their production:—

(1) Cornil and Ranvier [4]. As a result of fibrillation of the cartilage, the cells are cast into the joint, but at the margins this cannot happen, because the fibrous synovial investment shuts in the cells, thus they accumulate, and nodules of cartilage are formed which in time become bone: from which it would follow that the formation of marginal outgrowths is inevitable in any form of chronic arthritis. It is a clinical fact that very many cases of chronic arthritis never form osteophytes, and on this ground alone the theory is negatived. Again, we frequently meet with an exostosis on the base of the os calcis: this

cannot be explained by the above theory. It also fails to explain why the osteophyte in certain conditions occupies a constant position.

(2) The osteophyte or exostosis is due to a nervous dystrophy. At one time this was a widely accepted theory, suggested, no doubt, by the development of numerous osteophytes in the Charcot joint. In some cases of rheumatoid arthritis trophic changes in the skin, blood-vessels, and muscles are found, but these are just the cases where osteophytes are rarely met with. In the majority of cases where osteophytes are found (tabes and syringomyelia excepted) there are no other evidences of trophic changes. On these grounds it would be difficult to explain the outgrowths which occur around the joints of the men who are engaged in laborious occupations such as coal-mining and shoe-making.

(3) The osteophyte is due to the irritative action of uratic deposits in the neighbourhood (Dr. Wynne) [10], or of microbic poisons. It is true that there may be an overgrowth of bone in the neighbourhood of a joint which has suffered from an arthritis of undoubted infective origin, but this overgrowth tends to spread along the shaft of the bones, and is of quite a different nature to osteophytes or exostoses. Chronic syphilitic arthritis shows a good example of what I mean; there is often a periosteal overgrowth extending from the joint surfaces up and down the shafts of the bones, which enter into the formation of the joint. This theory fails to explain their presence in senile and traumatic arthritis, and also the constant position of the osteophyte in Heberden's nodes.

(4) They are produced by mechanical irritation of the joint margins, or of ligamentous insertions. Sir Arbuthnot Lane [7] was the first writer to draw attention to the effects of wear and tear on the bones and joints. To my mind this theory of mechanical irritation will explain the formation of bony outgrowths in every case, and I propose devoting the rest of this paper to proving it.

Sir Arbuthnot Lane bases his observation on the anatomical study of those who had undergone laborious occupations. A résumé of his views was printed in the *Proceedings* of last year. I will, therefore, not take up your time with repeating it. The proofs are numerous and convincing; in spite of this many observers consider that they do not hold good when applied to arthritis deformans. I will, therefore, approach the subject from two other aspects.

HEBERDEN'S NODES.

Heberden's nodes are osteophytic enlargements of the bony nodules normally present on the two terminal phalanges. These bony outgrowths only occupy one of the four margins of the joint, and that margin is always the same—viz., the posterior margin. In the more advanced cases smaller bony outgrowths may be detected on the other margins, but these are never as prominent as the posterior outgrowths; they will be referred to later.

Now if these nodules are merely the result of chronic irritation set up by inflammatory conditions of the joint all the margins of that joint would show the same liability to these formations, and one margin alone would not be picked out; we must therefore look for some special cause for this constancy of position. Those who agree with Cornil and Ranvier's theory explain this constant position of the osteophyte by the fact that the posterior ligament is very much thinner than the anterior or lateral. This is true, but the posterior ligament is thicker in the middle than at the sides, yet the bony outgrowth on the terminal phalanx occupies the middle of the posterior border, as may be seen in this specimen.

In a paper I published some years ago an analysis of forty consecutive cases of Heberden's nodes was made [2]. The inquiries showed (a) that the formation of Heberden's nodes is always preceded by some condition such as gout, infective or senile arthritis which leads to the weakening of the articular ligaments. (b) That the right index-finger is the commonest position for Heberden's nodes, then comes the right middle or thimble-finger; that is to say, Heberden's nodes are most often found on the fingers most used.

Now if the ligaments are weakened, constant use of the terminal phalangeal joint will lead to the last phalanx being tilted backwards, because opposition to the thumb is the chief action of this phalanx. The posterior margin thus receives an extra degree of pressure, and will therefore hypertrophy, the pressure being intermittent. The hypertrophy of the most prominent portions of the margin forms Heberden's nodes.

Considered from the mechanical point of view, these bony nodules serve a useful purpose; the pressure is now borne by bone, and is distributed over an increased surface. The fact that the more advanced cases may show bony outgrowths along the margins of the joints other than the posterior does not negative the above view, the probable

explanation being that in advanced cases the ligaments are so much weakened that support is needed on all sides, and not only on the side opposite the greatest pressure. In fact, mechanical irritation of the joint margins forms a simple explanation of the formation of Heberden's nodes.

It appeared to me that if the mechanical theory was the true one the study of osteophytes and exostoses in horses would be of value, for an animal like the horse is exposed to far more wear and tear than



FIG. 1.

Metatarsal bone of the horse, showing spavin.

man. I was able to collect a few specimens in Buxton, and later, thanks to the courtesy of Professor Macqueen and Mr. Hunting, to see numerous examples of phalangeal ostitis in horses. Three of the specimens come from Mr. Hunting's collection, and I am indebted to his article [6] on "Phalangeal Ostitis" for a good deal of my information on this subject.

EXOSTOSES AND OSTEOPHYTES IN HORSES.

The formation of exostoses and osteophytes on the phalanges of horses is common. Various technical terms are applied to the condition according to the bones affected. In order to explain these conditions, I cannot do better than show you actual specimens.



FIG. 2.

First and second phalanx of horse, showing high (A) and low (B) ringbone.
Notice ankylosis of joint.

Fig. 1 is a specimen of spavin, a term applied to bony outgrowths on the head of the metatarsal bone. Liability to spavin is dependent on the conformation of the hock, and is generally found on the inner side, because the greatest pressure or concussion is always felt on this side. This specimen also illustrates splint, generally the result of subjecting young horses to severe work.

Fig. 2, A, shows a case of high ringbone. You will notice very large bony outgrowths at the site of attachment of the lateral ligaments. Ringbone is common in horses with a long pastern, and in animals with unduly short or upright pasterns.

Fig. 2, B, shows a case of low ringbone; the joint is involved, in fact there is complete ankylosis. Of course, such extensive outgrowths do not occur in man, because complaints of pain will lead to earlier treatment.

Fig. 3 shows outgrowths along the pedal bone. These might be said to correspond to Heberden's nodes in man. It will be noticed



FIG. 3.

Pedal bone of horse, showing exostoses on extensor aspect.

that extensive bony outgrowths may occur without involvement of the cartilage.

Figs. 4 and 5 illustrate a case of cab-horse disease. This term is applied to the formation of an exostosis on the long pastern bone of the front leg. This growth is always situated on the inner side, and is associated with destructive changes of the cartilage in the adjoining joint.

Amongst veterinary surgeons the recognized cause of all these conditions is some form of wear and tear, such as concussion or hard roads, or strain of ligaments produced by jumping or starting heavy loads. The following facts go far to prove this:—

(1) Only the phalanges, metacarpal bones, and metatarsal bones are

affected. This form of outgrowth is not found on the other bones of the horse. From the formation of the horses' legs, the ligaments and bones in this situation receive the greatest strain, and of necessity absorb most of the concussion before it reaches the larger bones.

(2) It is commonest in horses at work for some time on hard pavement. Thus in every eight horses that come to be slaughtered in London one has been found to suffer from cab-horse disease.



FIG. 4.

Long pastern bone, anterior aspect. Cab-horse disease.

(3) The position of the outgrowth in cab-horse disease and spavin is constant—viz., the inner side, as the greatest strain or concussion always falls on the inner side on account of its being more under the centre of the superincumbent weight.

Heredity is mentioned by veterinary surgeons as an important factor. This chiefly concerns the shape of the hock, the upright short hock being predisposed to the formation of exostoses. There appear, however, to be cases of ringbone due to heredity where the shape of the

hock has been good, as if there was some constitutional liability to throw out bone in response to the slightest stimulus.

I think the above facts are sufficient to exclude microbic disease or septic absorption as causes of this arthritis and exostosis. The horse is a clean-living animal, and is not exposed to microbic diseases like man, though I see from an article in the *Lancet* [3] that pyorrhœa alveolaris is common. From the evidence before you to-night, we are justified in saying that mechanical irritation, and mechanical irritation only, may be the cause of bony outgrowths with or without arthritis.

To complete the paper, I will attempt to show how the application of this principle will explain various phenomena in connexion with the formation of osteophytes and exostoses. It is a significant fact that the



FIG. 5.

Superior aspect of long pastern bone to show cartilage in cab-horse disease.

arthritic diseases in which movements are encouraged, such as gout and senile arthritis, are the diseases in which osteophytes are most commonly formed; whereas those joint diseases, such as tuberculosis, gonorrhœa, and severe rheumatoid arthritis, where movements are prevented by pain or muscular weakness, very rarely show osteophytes.

Osteophytes are found in chronic gonorrhœal, typhoid and septic joints rarely, and only after a long time, when the joint condition is so much improved that movement is allowed. The following cases illustrate this point (figs. 6, 7 and 8).

Charcot pointed out that muscular wasting varies inversely with the bony enlargement, and Dr. A. E. Garrod [5] says that in rheumatoid arthritis the muscular wasting is most pronounced where there is little



FIG. 6.

Left hip of a man, aged 23 ; hand-stamper. On and off for the last six years there has been pain in the knee and thigh. The movements of the left hip are only slightly restricted, there is $\frac{1}{2}$ in. shortening of the femur. No disease in the knee. He had tuberculosis of the left hip twenty years ago. There are two scars, one on each side of upper part of thigh, the site of sinus. This illustrates the formation of osteophytes in a joint which has recovered from tuberculosis.



FIG. 7.

From a carpenter, aged 45. For two years there has been slight pain in the left elbow. Twenty years ago the man had osteomyelitis of the right tibia and ulna (confirmed by scars and skiagrams), also some arthritis of the left elbow. He was seriously ill for ten months and recovered sufficiently to do his work as a carpenter. The case illustrates the development of osteophytes in a joint previously damaged by a septic arthritis.

osteophytic formation. Muscular wasting occurs in the most severe forms of rheumatoid arthritis, and the more severe the disease the less the joint is used; hence the absence of osteophytes. If the Ranvier or the trophic theory were the true explanation, we should expect to find the reverse—viz., the more severe the disease the greater the formation of osteophytes.

Those who were present at the last International Congress may remember that Mr. Kenneth Goadby showed three rabbits; into one knee of each he had injected an organism obtained from the gums of people suffering from rheumatoid arthritis. Marked osteo-arthritis



FIG. 8.

From a woman, aged 31. Four years ago she was the subject of typical rheumatoid arthritis. A marked improvement followed Plombières douches and vaccine treatment. The backwards subluxation of the tibia was corrected by Hoeffteke's splints and the patient now walks about. This skiagram was taken after the improvement. A previous skiagram of the knees taken at the height of the disease shows no bony outgrowths. This illustrates bony outgrowths in a case of rheumatoid arthritis, which developed only after the condition had improved sufficiently to allow of the patient walking.

resulted in the injected knees. At first sight it appeared as if a microbic poison was the direct cause of the osteophytic formation, but, on examination of the rabbits, one found that the affected knee was used as much as the normal knee. The rabbit did not hold up its leg like a dog with an injured foot. I therefore suggest that the

ligaments having been damaged by the poison, the use of the knee allowed a freer play between the femur and tibia, and hence mechanical irritation of the margins. Drs. Poynton and Paine [8] figure two examples of osteo-arthritis as a result of the injection of diplococci. The same explanation may hold good. Dr. Buckley [1], in a paper entitled "Osteo-arthritis and Chronic Rheumatism," illustrated different types of cases—traumatic, static, infective and gouty—and showed that the development of osteophytic changes was practically indistinguishable. The chemical poisons were obviously different; there were no signs of



FIG. 9.

Exostosis on the base of the os calcis.

trophic changes, whereas the mechanical theory will apply to the whole group.

Again, this explanation holds good for the production of osteophytes in Charcot's disease. The trophic changes in the joint lead to damage and stretching of the ligaments and, as there is no pain, the joint is used as if little was the matter; there is consequently mechanical irritation of the margins. Added to this, as Turney [9] suggests, there is an incoördination of reaction which leads to excessive response to stimuli.

I have previously referred to exostoses at the base of the os calcis. Fig. 9 is a good example. As a sequel of rheumatism, flat-foot

developed. This led to frequent strain of the long plantar ligament, and consequent irritation at its insertion in the bone. It might be argued that an infective fibrositis had spread along the ligament to its insertion and set up a bony overgrowth, but I think that if this were the case the overgrowth would have been more diffuse, and not accurately localized to the insertion of the ligament. The mechanical explanation brings this condition into line with the formation of rider's bone.

I am prepared to admit that in some cases the osteophytes and exostoses appear to be out of all proportion to the wear and tear to which the joints are exposed. It will be remembered that in the horse heredity is an important factor, and I think there are strong grounds for suggesting that in some families there is an inherited susceptibility of the joints to wear and tear, as if the bone-forming cells were hypersensitive; conversely, some individuals are too anæmic and weakly to react to the stimuli, and thus incapable of forming osteophytes.

In conclusion, I contend that the production of osteophytes and exostoses in gout and arthritis deformans is due to mechanical irritation. It is not the sign of a specific disease, but a secondary change, dependent on the amount of work performed by a diseased joint. Their presence in these diseases signifies that the joint has been used while the ligaments are still weak from some pathological condition, such as senile degeneration, gout, trauma, trophic changes, or microbic disease.

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DISCUSSION.

Dr. KERR PRINGLE could not altogether agree that mechanical causes such as friction and pressure were the sole factor in the production of Heberden's nodes and instanced the frequency of the condition in the joints of well-to-do old ladies who had never done any hard work. Nor could he agree with the statement that the cause of the nodes being more pronounced on the extensor aspect of the joint was due to strain or pressure on the extensor surface as Dr. Burt had demonstrated. He pointed out that the condition very frequently commenced in the terminal joint of the little finger, where there was little or no pressure or strain, long before it made its appearance in the other digits. He drew the attention of the Section to the admirable papers on the morbid anatomy and histology of chronic arthritis by Nicholls and Richardson, and Lindsay Milne, where these authors had demonstrated that bony outgrowths or "lipping" took place where the perichondrium, cartilage, "zone of provisional calcification," synovial membrane and capsule approximated, either by transformation of the attached fibres of the capsule into fibro-cartilage which ultimately became bone, or by an overgrowth of the perichondrium itself where it begins to unite with the fibrous tissue of the capsule.

Dr. J. METCALFE congratulated Dr. Burt on his paper, which exhibited a very careful scientific investigation of the conditions which they were considering. Speaking as a radiologist, he (Dr. Metcalfe) divided all the chronic arthritic cases into (1) those of an atrophic nature with atrophy of cartilages, narrowing of spaces between the ends of the bones and atrophy and erosion of the bones; (2) the hypertrophic type—the type Dr. Burt had chiefly considered, accompanied by the formation of osteophytes, Heberden's nodes, &c. The point, however, he wished to press home was the frequency with which early tubercular conditions of joints had been diagnosed as arthritic and the danger to the patient resulting. The differential X-ray diagnosis between arthritic and tubercular joints was comparatively easy and should never be neglected. Dr. Metcalfe also drew attention to the usefulness of ionic applications of iodine, &c., in reducing some forms of exostoses.

Dr. CAMPBELL MCCLURE expressed his concurrence with the view put forward by Dr. Burt as to the non-specific character of osteophytes and exostoses, and suggested that experiments might be carried out in the way of immobilizing the joint of any animal which had been experimentally inoculated to produce arthritis, just as experiments had been carried out in preventing the deformity of bone in experimental rickets by preventing the animal using its limbs.

Dr. BUCKLEY quite agreed as to the importance of mechanical factors in the production of osteophytes. He thought, however, that the bony

overgrowth was the result of neurotrophic influences having as their object the supporting of the joint at the point of greatest stress, which need not always be the point of greatest wear and tear of the bony surfaces, though it was so as a rule. They should be regarded as reparative. He thought that arterio-sclerosis was an important fact in the development of bony outgrowths of this kind and instanced the thickening which was known to occur in the metatarsal and metacarpal arteries of horses. The arterio-sclerosis led to defective nutrition of the joints, hence increased wear and tear, and, as a consequence, the system took measures to strengthen the weak spots by throwing out fresh bone.

Dr. BURT, in reply, said that he considered that arterio-sclerosis and faulty circulation only led to the formation of osteophytes indirectly, as a result of degeneration of the joint ligaments. With regard to the actual growth of the osteophytes, Nichols and Richardson, in the *Journal of Medical Research*, 1909,¹ had described and illustrated the growth of the osteophytes from the perichondrium and shafts of the bone, but stated that the reasons for these secondary bony changes were not clear (p. 177). This present paper was an endeavour to explain those reasons. The views on bone formation had in recent years undergone great changes as a result of Macewen's work. The essential unity of the osteoblast and chondroblast or the exact function of the periosteum did not affect the present thesis, the point being "what gives rise to the overgrowth of tissue," not what tissue overgrows. The fact that old men and women in a good position developed Heberden's nodes did not negative the views set forth, because, however good the position, letter-writing and needle-work were indulged in. In answer to Dr. Metcalfe, the writer considered that atrophic changes owed their origin to entirely different circumstances; the actual process was well described in the paper by Nichols and Richardson just referred to. Considering the title of the paper, he had not referred to these changes. He quite agreed with Dr. Buckley that the overgrowth formed a buttress or mechanical support. The whole process was an attempt by Nature to compensate the comparatively excessive use of the joints.

¹ *Journ. Med. Research*, Boston, 1909, xxi, pp. 149-221.

Balneological and Climatological Section.

April 2, 1914.

Dr. WILLIAM EWART, Vice-President of the Section, in the Chair.

Painful Affections of the Shoulder: their Diagnosis and Treatment.

By C. W. BUCKLEY, M.D.

THE increasing frequency of painful affections of the shoulder cannot fail to have struck the majority of medical men engaged in general practice, and in the more chronic form they constitute some of the most difficult cases we have to deal with at the spas. In the past a number of different conditions have been confused together under the name of brachial neuritis, and it is to this group that I propose to devote most attention, though not to the exclusion of other diseases.

From a mechanical point of view, the shoulder-joint differs in so many important points from other joints as to justify dealing with the causes and treatment of stiffness and pain in this region separately. The articulation between the humerus and the glenoid cavity of the scapula is so constructed that the bones are only retained in contact by the negative pressure in its interior, and by the muscles surrounding it; it is thus capable of sustaining pulls and wrenches, and afterwards regaining its normal state, without such serious injury as would be the case in a joint differently constituted. The glenoid cavity stands more in the relation of a pivot than a socket, and only transmits any thrust or weight in certain positions of the arm, in which respect its function differs from that of many other joints. Consequently, it suffers less from the effects of wear and tear than the joints of the legs, which have to bear the weight of the body. Further, the scapula and clavicle are movable to a considerable extent, and the strain is thus distributed. Probably in that stage of evolution in which we went on all fours the

importance of the joint was much greater; with the assumption of the upright position the mechanical conditions have altered, and the arch which is formed by the acromion process, the coraco-acromial ligament, and the coracoid process, has a very important part to play in bearing any pressure which may be exerted so long as the arm is directed downwards, and with the subacromial bursa it forms a kind of secondary joint, in which the head of the humerus, covered by the tendons inserted into the great tuberosity, revolves. The importance of this arch and the bursa beneath it, and the peculiar movements of the shoulder in which it is concerned, were first discussed by Duchenne [6], and later by Cathcart [2] and Cleland [3] in this country, in 1884, though their work appears to have been completely overlooked by those American writers who have investigated the subject more recently.

This secondary socket does not form a true joint, and the bony surfaces which are in contact are not covered by cartilage. The subacromial bursa which separates them deserves careful attention. It is about 2 to 3 in. in diameter, its floor being formed by the greater tuberosity of the humerus and the tendons which are inserted therein, mainly the supra- and infra-spinatus. Its upper surface is in contact with the arch just described, and in full abduction it passes entirely beneath this arch, but with the arm by the side a portion of it extends beneath the deltoid muscle, a point which is of some importance in the diagnosis of injuries of this structure. It is firmly attached in its central part to the structures lying above and beneath, while the periphery is entirely free, so that the movements of the humerus beneath the coraco-acromial arch can be freely carried out. By reason of its position it is brought into play in almost all movements of the shoulder, and is specially liable to injury.

The extent and arrangement of the aponeurotic structures of the shoulder, and the position of the cords of the brachial plexus lying close to the joint on its anterior and axillary aspect, with the circumflex nerve winding round the neck of humerus, must be borne in mind in making a diagnosis, but they do not call for detailed description.

The most frequent cause of pain and stiffness in the shoulder is inflammation of the subacromial bursa. The characteristic feature is pain associated with limitation of movement of a definite and peculiar type—namely, inability to abduct the arm beyond the level of the shoulder or to rotate it, except to a very slight extent. The patient cannot put his hand to the back of his head, nor yet to the back of his waist, and if the scapula be firmly held in position, he can only raise

the arm from the side to the extent of about 10° . The explanation of this peculiar limitation of movement has been fully worked out by Küster [7], and later by Codman [4], who brought out more fully its importance and the frequency with which it occurs. It is due to the muscles whose tendons lie in the floor of the bursa—namely, the supra- and infra-spinatus—and to a less degree the teres minor. The muscles all take part in movements of rotation, while abduction is generally commenced by the supraspinatus, the deltoid coming into play after the movement has been begun (Cathcart [2], Codman [4]). If the bursa is inflamed, any movement of these tendons will be extremely painful, and will be prevented by spasm. Flexion and extension of the arm—that is, movement forwards and inwards, or backwards and outwards—will be little if at all interfered with, since the muscles performing this movement do not come into relation with the bursa.

The pain is variable in degree. In slight or chronic cases it may only be perceived when movement is attempted, while in the more severe forms, where there is much effusion into the bursa, or where surrounding structures are implicated in the inflammatory process, it may be intense even at rest, and sometimes requires morphia for its relief. It is felt chiefly around the point of the shoulder, and radiates down the arm to the insertion of the deltoid, where it is sometimes more severe than at the shoulder, and is often accompanied by hyperæsthesia at this point. In severe cases it may even shoot down to the fingers, and closely simulate neuritis. It is also commonly referred to the vertebral end of the supraspinous fossa, where hyperæsthesia is sometimes found. This extensive area of referred pain may be due to extension of the inflammation along the tendinous intersections of the muscles in relation with the bursa, or to extension to the trunk of the circumflex nerve, which lies close to the edge of the bursa; pain would thus be felt along its branches, and also in severe cases probably in the cutaneous distribution of the musculo-spiral nerve.

An acutely tender spot will be found in the inflammatory stages just below the tip of the acromion and external to the bicipital groove. This is due to the inflamed bursa, which here lies unprotected by bone; if the patient will permit abduction of the arm, which will rarely be the case, this tender spot will disappear as the bursa is carried beneath the acromion, and this constitutes Dawbarn's sign [5], which is almost pathognomonic. In several cases I have noticed that the space between the acromial arch and the head of the humerus is much increased, normally they should be in close contact; this is shown in X-ray photographs, and

is best marked in moderately late stages, of a month or more duration, that is. It is probably due to relaxation of the muscles to relieve the inflamed surfaces from pressure, perhaps in some cases to effusion into the bursa, though it is to be noted that effusion into the shoulder-joint might cause it equally well. I show a skiagram of a case in which it is well marked (*see figure*). This also shows a shadow between the acromion and the head of the humerus, due, I believe, to the deposition of lime salts in the wall of the bursa. Its position shows that Codman's suggestion that such deposits when they occur are in damaged tendons is incorrect. The man was a painter, and was suffering from acute gout in the great toe when admitted to the hospital, in addition to subacromial bursitis, probably of gouty origin.

The muscles round the shoulder-joint may be much wasted, either from disuse or from a reflex trophic effect analogous to that seen in acute synovitis of the knee, where the wasting of the quadriceps is often very marked, and there may in severe cases also be wasting of other muscles of the arm and oedema of the hand; in such cases the diagnosis from brachial neuritis is very difficult. The cases fall naturally into two groups, according as they are the result of injury or disease. They may arise as the result of very slight injury. I have seen a well-marked case which resulted from carrying a heavy bag, and another case has been recorded as the result of digging, the individual being unused to this form of exercise. On the other hand, bursitis may be only a part of much more extensive injuries, at least the characteristic limitation of movement may be met with in association with evidence of extensive damage to neighbouring structures.

Thomas [9] has investigated a series of cases of stiff and painful shoulders, and by experiments on the cadaver and post-mortem examinations has demonstrated that symptoms similar to those which I have described may be due to an entirely different cause. He criticizes Codman's views, and holds that "neither the symptomatology nor the ætiology, as given by Codman and Küster, localize the seat of the trouble in the sub-deltoid bursa." After a careful study of the works of both of these authorities, supplemented by personal observation of a considerable number of cases, I am satisfied that Codman's theory is adequate to explain most of the cases, but that a few remain of the nature of those described by Thomas. He puts forward the view that "a peri-arthritis from tears of the axillary portion of the shoulder capsule, due to forced abduction, offers the best explanation of the stiff and painful shoulders, with loss of power in the arm." Such cases are always

traumatic in origin, and result generally from a fall in which the hand has been thrown out to save the body, especially a fall from a height broken by catching at some object. The head of the humerus is brought into sudden and violent contact with the axillary and anterior portion of the capsule of the joint, which is the thinnest part, causing a tear without dislocation necessarily resulting, or, if it should occur, it may be reduced as the arm falls to the side again. The immediate result is effusion around and in the joint, with restricted movement, and, in the absence of proper treatment, a chronic periarthrititis with contraction of the capsule results, and consequently a stiff shoulder. If the



Note separation of humerus from acromion and bar of slight opacity between ;
(?) due to calcareous deposit in wall of bursa.

nerve-trunks are implicated brachial neuritis may ensue. In these, as in uncomplicated cases of bursitis, there is acute pain around the shoulder, radiating down the arm, and restriction of movement varying in degree according to the extent of the injury. In the early stages this restriction of movement is due to spasmodic contraction of muscles, in the later to contraction of the torn capsule, which will inevitably result if the arm is allowed to rest in the adducted position after the accident, this position being that of greatest ease.

These traumatic cases are of great importance from the point of view of the Workmen's Compensation Act and call for the greatest care

in diagnosis, prognosis, and treatment. The prognosis of uncomplicated bursitis is good, in fact it may be said to have a natural tendency to recover, though often after a long time. This depends upon the extent and density of the adhesions in and around the bursa, but they usually become sufficiently stretched or absorbed in time to cause no serious inconvenience. On the other hand, disability arising from a contracted capsule may prove permanent, and too much care cannot be exercised in determining which condition is present.

Subacromial bursitis, while frequently traumatic in origin, may be due to such causes as rheumatism, gout, gonorrhœa, pyorrhœa alveolaris, and other septic or infective conditions, sometimes primarily, sometimes secondarily to fibrositis of adjacent structures. The gleno-humeral joint may be affected at the same time, but quite frequently it appears to escape, it may, however, become affected later by direct extension from the bursa, or this process may be reversed. The creaking which is often met with in the shoulder is usually due to chronic bursitis and not to arthritis of the joint, which causes quite a different sound hardly to be described as merely creaking. It must always be remembered that a very slight accident may give rise either to bursitis or to a tear in the capsule, as is shown by recorded cases; and complete dislocation has been known to occur after so slight an accident that the patient has taken no notice of it until the disability was found to be persistent. Further, slight symptoms at the time of the accident may be followed by much more severe ones after an interval of weeks, as in a case recorded by Viotor [10], due to a fall broken by catching at the handle of a door. At the outset there was pain, weakness of the deltoid and limitation of movement; these symptoms improved, but four weeks later the patient suddenly became worse with most intense pain and all the symptoms of a severe neuritis. This case almost certainly belongs to the group described by Thomas, the nerve-trunks in the axilla becoming implicated in the adhesions formed as the tear in the capsule healed.

The points to which most importance should be attached in distinguishing between a torn capsule and a bursitis of traumatic origin are: the position of greatest tenderness—in an injury to the capsule this will probably be in the axilla, in bursitis just below the tip of the acromion; the distribution of the pain in the supraspinous fossa and the degree of wasting of the supraspinatus, which will generally be greater in bursitis; and the limitation of movement, in both rotation and abduction, will be restricted, but backward and forward movements

are likely to be more restricted in an injury to the capsule than the bursa. The early development of definite neuritis is more likely to follow an injury to the capsule, but the pain of bursitis may so closely imitate a neuritis that I do not think much reliance can be placed on this symptom in diagnosis.

Before the traumatic lesions are dismissed a brief reference may be made to fractures and dislocations, not because of any special difficulty which should exist in diagnosing them from such conditions as I have described, but because in spa practice they may not be suspected. It is sufficient to say that careful examination should include measurements in any doubtful case and the use of the X-rays where possible.

Brachial neuritis presents great difficulties in diagnosis from severe bursitis, and may occur at the same time as a result of the spread of a fibrositis to both bursa and nerve-trunks, in the same way as sciatica may be an extension of a fibrositis of the lumbar or gluteal fascia. Perineuritis as a primary condition is, I believe, extremely rare, but the intense pain which may attend bursitis has led to these cases being often diagnosed as neuritis pure and simple, and it is probable that the circumflex nerve is frequently implicated by extension of the inflammation. A case which I had the opportunity of watching for many months shows the difficulties very well. The patient after many years of nervous and physical strain developed cervical adenitis and had several glands removed. Pain radiating down the left arm followed one operation on a gland about the middle of the border of the trapezius in the neck, and when I saw her nine months later there was well-marked and unmistakable neuritis, which had been regarded as due to the operation; trophic changes in the skin were well marked, there was oedema of the hand with stiffness of the finger-joints due to a secondary periarthrititis, the muscles of the whole arm were much wasted, and the hyperæsthesia was intense, especially over the scapula and the areas supplied by the circumflex and musculo-spiral nerves. All movements were painful, but the limitation was chiefly in abduction and rotation. Investigation showed that although the teeth were fairly good and the gums apparently healthy on inspection, there was pyorrhœa alveolaris present, and a vaccine was prepared from this source which produced a marked local and general reaction. The neuritis gradually cleared up, the muscles regained tone and strength, and the skin resumed its normal condition, but pain had already begun to be felt in the right shoulder, chiefly at the tip of the acromion and

the insertion of the deltoid. At this stage the patient had a resumption of the physical and nervous strain for a few weeks, during which time she had the worst teeth removed and the others suitably treated. When she came under my care again two months later the condition of the right arm was almost exactly that of the left when I first saw her, though to a less severe degree so far as trophic symptoms and hyperæsthesia went. The left arm had regained to a great extent its normal functions, though pain was felt there during the period of reaction after an injection of the vaccine, and the finger- and wrist-joints were still rather stiff. I came to the conclusion that the condition on both sides was a definitely infective one attacking an enfeebled subject, but while there was no doubt as to the neuritis on the left side I think that the condition of the right arm was due to fibrositis and bursitis, there being little implication of the nerve-trunks, which were not tender on pressure. The maximum tenderness was over the subacromial bursa and the scapula, and it is probable that there was a perineuritis of the circumflex nerve.

This case indicates the lines upon which the diagnosis between the conditions under consideration may be made. I would insist more particularly upon the trophic symptoms, the distribution of hyperæsthesia and the tenderness of the nerve-trunks. At the same time it must be borne in mind that there may be a neuritis of the smaller nerves, due either to a general fibrositis affecting the whole arm or to reflex causes. In a former paper [1] I have dealt more fully with brachial neuritis, and shall therefore go no further into this subject now. At the same time I must admit that I did not then distinguish subacromial bursitis with sufficient clearness from perineuritis.

Arthritis of the gleno-humeral joint will not, as a rule, present much difficulty in diagnosis; it is unusual to find arthritis of this joint alone, and if others are implicated the diagnosis will be easy. The limitation of movement is different in character, not being restricted to rotation and abduction, while the pain on movement is very much less. The creaking of the joint in an advanced arthritis is also quite different from the creaking of a chronic synovitis, such as may be met with in the bursa.

Dislocation of the biceps tendon from its groove is supposed to offer difficulties, but I agree with Luff [8] that many cases supposed to be due to this lesion are really cases of subacromial bursitis. Synovitis of the sheath of this tendon would be difficult to distinguish, and would depend upon careful examination for points of tenderness and restriction of movement which would affect the usual action of the biceps.

Fibrositis in the region of the shoulder, if uncomplicated, will produce but slight symptoms, transient in character; if it has extended, then the diagnosis must depend on the structures affected.

Arthritis and other conditions of the acromio-clavicular joint will be obvious on careful palpation, with attention to the position of the points of greatest tenderness.

Tuberculosis of the glenoid or of the humerus and axillary abscess may be met with, but do not call for special consideration, since their detection will depend on the general principles which have already been referred to in other conditions.

The possibility of anginal pain being regarded as brachial neuralgia or neuritis must be borne in mind. I have known the mistake to be made more than once. There is no need, however, to dwell on the differential diagnosis; careful examination will prevent any mistake.

In the treatment of lesions of the bursa, the capsule, or the nerve-trunks, rest is of the utmost importance in the acute stages, and upon the completeness of the rest the length of disability will materially depend. In severe cases the patient should be kept in bed until the more acute symptoms have subsided. Codman advises that the arm should be kept fully abducted if possible; this cannot always be arranged in the worst traumatic cases, and sometimes pain will render it impossible in other forms. The usual methods should be adopted to further the subsidence of the inflammation, and of these perhaps blisters, or poulticing after painting the surface with tincture of iodine, will be found most effective. Anodyne liniments externally, and aspirin or other salicylates internally, may be of use. Where the pain is very severe these methods may fail, and morphia be required, but as the pain may persist for some time opiates are inadvisable if they can possibly be dispensed with, and usually the coal-tar products, with or without aspirin, will suffice.

When the patient gets about the arm must be supported in a sling, carefully adjusted, so as to take all weight off the shoulder, until all sign of inflammation, whether of bursa or of nerve-trunks, has disappeared, and only adhesions remain to be dealt with. This does not mean until all pain has disappeared, for pain on the slightest movement may be felt for months, due mainly to adhesions, which it is the object of treatment to get rid of. The arm from the beginning should be moved passively once or twice a day through the whole range of movement possible in the acute stage, and as the condition becomes more chronic the patient should be instructed to abduct the arm by placing it against a wall and

gradually pushing it up to the highest point he can reach. This point is to be marked, and each succeeding day the movement should be repeated, marking the level attained. This exercise and others which may be devised should be performed at stated times and repeated as may be prescribed by the doctor, but the patient must be warned against perpetually fidgeting with the arm in what should be intervals of rest.

A great proportion of these cases come to the spas sooner or later to be treated, often after wasting much time and money elsewhere without effect. They are then usually in a chronic condition, adhesions have formed, and pain is more or less constant if the rule of rest has not been observed. In this stage and until the pain has been subdued to a great extent the best treatment will be by means of local heat, such as packs of peat or fango, radiant heat or other forms of heated air, or diathermy, which, although I have not as yet had much experience with it, seems likely to be of much value in these cases. Cataphoresis with sodium salicylate in the painful stages, and with iodine or iodide of potash later, will often be found useful. As the pain diminishes hot douches will help, and massage may cautiously be begun. Massage should not be used if it elicits pain, especially if there is any neuritis; it should be gentle, tender spots are to be avoided, and the chief aim is to restore the tone of the muscles and the circulation of the limb generally.

The question of surgical measures may have to be considered, but Codman [4], after an exhaustive trial of various methods, has come to the conclusion that breaking down of adhesions under anæsthesia in cases of bursitis presents no advantages over the more gradual process referred to already. He has in several cases opened the bursa, and broken down the adhesions digitally, but after this experience he concludes that it is meddlesome surgery to interfere unless the pain is exceptionally severe or the disability great. In cases of contracted capsule, forcible movement under anæsthesia often results in marked improvement, but may also cause further damage.

Treatment of the underlying cause must not be forgotten in the non-traumatic cases. Where there is a definite focus of infection, as in pyorrhœa alveolaris, this should be rigorously treated, while gout and rheumatism in all forms are met with in the various disorders of the region of the shoulder, and furnish strong arguments for spa treatment. There seems to be a peculiar liability to fibrositis of the shoulder, and the evils which follow it, if neglected, in people who have undergone a long period of nervous strain, and in those of neurotic temperament.

In these individuals, treatment at home will frequently prove ineffective, whereas in a suitable health resort with skilled treatment and sufficient rest they speedily recover. In such cases the glycerophosphate of calcium alone or in combination is a tonic of considerable value.

With the most thorough and careful treatment, however, the greatest patience will often be required, and it is well to tell the patient at the outset that months may elapse before he is free from all pain and disability, impressing upon him at the same time that the more completely the limb is kept at rest, apart from the prescribed exercises, the sooner he will be well.

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DISCUSSION.

Dr. W. J. MIDELTON said he had listened with great interest to Dr Buckley's paper, and was glad he had pointedly drawn attention to bursitis and tearing of the capsule. It was a great temptation to label pain in the region of the shoulder brachial neuritis, and overlook other conditions. He could remember two striking cases: (1) Patient, aged 66, fell down a long flight of steps and injured his left shoulder. No fracture was made out. In spite of careful treatment pain from the shoulder to the finger-tips became very severe and persisted. The upper arm wasted, the forearm became oedematous, and the joints of the fingers assumed a "rheumatoid" aspect in addition to general swelling. After three months the patient was sent for change of air and came under Dr. Middleton's notice for the first time. With some difficulty he persuaded the patient to allow him to apply a blister measuring 4 in. by 4 in. on the back, close to the spine, in the lower cervical and upper dorsal region. The raw surface produced was subsequently kept open for several days with savin ointment. The relief of pain was most gratifying and the patient within a month recovered the use of his arm. Six months later the patient reported that his arm was strong, supple, and free from pain. He also said his general health was excellent. (2) A similar case. Patient, aged 57, fell from his

bicycle and injured his left shoulder, which up to that time, as far as he knew, had been normal. A fortnight later he fell again much as before and injured the same joint. Subsequent events closely resembled those of Case 1. The pain was so intense that the patient became delirious at night. A blister was applied as before and the result was equally gratifying as regards pain, but sarcoma of the head of the humerus was diagnosed a month later and a "fore-quarter" operation performed. In Dr. Midelton's opinion, judging by the history, the sarcoma developed largely as the result of the injury, the borderline between inflammation and sarcoma being a narrow one, he thought. He agreed with Dr. Buckley that in cases of bursitis rest should be advised. At the same time, passive movements should be carefully carried out under the supervision of the medical attendant. He strongly deprecated haphazard advice regarding rest and movement. In cases of torn capsule with adhesions premature forcible movements were disastrous, in his opinion. Gentle massage and slight passive movements were beneficial. Adhesions should not be violently dealt with until practically all inflammation had ceased. He had seen several cases of painful shoulder-joints, with wasting of surrounding muscles, after removal of tuberculous glands.

Dr. LIONEL CALTHROP (Woodhall Spa) thanked Dr. Buckley for his interesting paper and cordially agreed with his remarks on treatment. The recognition of the true nature of many of these cases—viz., a bursitis—had been a great assistance in treatment, and the series of skiagrams which Dr. Buckley had handed round proved the advantage which was derived from examining every case of trouble about the shoulder-joint with X-rays in order to complete the diagnosis. Passive and active movements must be persisted in for weeks in order to regain complete mobility, and it was seldom that forcible breaking down of adhesions was necessary.

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Section for the Study of Disease in Children.

October 24, 1913.

Dr. LEONARD G. GUTHRIE, President of the Section, in the Chair.

Two Cases of Infantilism.

By C. E. ZUNDEL, M.D.

CASE I.—INFANTILISM ASSOCIATED WITH ALBUMINURIA.

L. S., GIRL, aged 13 years. Eldest of three children. "Does not seem to have grown since she was 5 years old."

Personal history: Was a full-time child and healthy at birth. She had measles when 4 months old, but has had no other illness, though from time to time she has been treated for "anæmia." Began to talk at 9 months and could walk at 2 years.

Family history: Father is living, 5 ft. 10 in. in height. Mother is living, 5 ft. 2½ in. in height. She is the smallest of a large family, of whom some are over 6 ft. in height. Two other children in family are normal in appearance and development.

Present condition: Height, 3 ft. 6 in.; weight, 2 st. 10½ lb. Skin rather dry and slightly dusky; hair not scanty, but does not grow well. Intelligent; does £ s. d. sums satisfactorily. Temperament docile and quiet. Urine: Specific gravity 1004, reaction acid; on boiling, there is a cloud of albumin; a few fatty and granular casts are found in the deposit after centrifuge. Nocturnal enuresis is frequent. Blood-pressure, 110 mm. Hg. No evidence of retinitis; thyroid gland is just palpable. No abnormality of other organs is manifest.

There is nothing to suggest tuberculosis or syphilis.

CASE II.—INFANTILISM ASSOCIATED WITH DIABETES INSIPIDUS.

W. B., aged 13 years. Second child of a family of three. "Has diabetes and does not grow."

Personal history: At the age of 3 years he was admitted to a hospital for a week with a severe sore throat; his mother was told that



Case I.

L. S., aged 13 years.



Case II.

W. B., aged 13 years.



Case II.

(The boy is holding an 18-in. rule.)

he "just missed having diphtheria." Polyuria and polydipsia date from this illness. He has had no other illnesses, but has spent six years of his life in various infirmaries. His thirst is so great that he is said to drink street puddles, bath water, and even his own urine.

Family history: Mother is living and healthy; father died at the age of 47 years, of pneumonia. He is said to have suffered from child-

hood from "diabetes," and was known among his comrades as the "water-barrel," on account of his constant thirst. He served for twelve years in the Army. A brother died at the age of 7 years with diabetes insipidus, which he had had for five years; his urine was frequently examined, but sugar was never found. One elder sister is alive and well. No cases of diabetes can be traced among the other relatives.

Present condition: Height, 3 ft. 6 in.; weight, 2 st. 1½ lb. Skin rather dry; appearance wasted. Disposition miserable and passionate. Intelligence fair, but he has had practically no education. Epiphyses are clearly defined; thymus not enlarged; testicles "childish"; pituitary fossa appears normal in radiogram. Administration of anterior lobe extract causes no pyrexia; carbohydrate tolerance 220 grm. of cane-sugar. Urine: Clear, pale, specific gravity 1000 (at body temperature), contains no albumin, no sugar, and no casts; urea percentage is 0.5. Blood-pressure, 100 mm. Hg. Thirst: On the average he drinks 14 pints of water per diem. Appetite: Very small, and he has a strong distaste for sweet foods. At the beginning of his trouble his appetite was large, but was soon lost.

DISCUSSION.

Dr. ZUNDEL added that in the case of the girl the general appearance and the dryness and duskiness of the skin suggested to him the possibility of hypothyroidism as being the cause of the delay in development. Holding this view, he had already commenced to administer thyroid extract. The case might be one of those in which the lack of thyroid activity did not seem to result in the appearance of cretinoid or myxœdematous characters. In the case of the boy there seemed to be a possibility that the diabetes insipidus and the infantilism were independent of each other, in view of the fact that his father, who is said to have suffered from diabetes insipidus from childhood, apparently passed as a normal individual and was able to beget three children. The boy had been treated with ergot, but so far without any effect being apparent.

The PRESIDENT (Dr. Guthrie) thought the absence of cardio-vascular changes in Case I was against the diagnosis of chronic interstitial nephritis and that hypothyroidism might account for the infantilism.

Constriction of Arm by Amniotic Bands.

By E. A. COCKAYNE, M.D.

C. W., A GIRL, aged $3\frac{1}{2}$ years. The confinement was a difficult one, but nothing was discovered to account for the condition of the arm. There are two other children: the first, a girl, aged 6 years, has a raised capillary nævus on the right side of the abdomen; the third, aged 1 year 10 months, has a similar nævus on the shoulder. The mother calls them respectively a strawberry and a raspberry, and thinks they become brighter when those fruits are in season. All three children have convergent strabismus. There is a narrow fibrous band which completely encircles the upper arm on the right side and causes slight constriction, and another which deeply constricts the arm just above the wrist; in flexion—the intra-uterine position—the two scars are at the same level. The scar tissue is adherent to the deeper structures and the bone feels grooved, but a skiagram shows that it is not involved. The right arm and hand are well developed and larger than the left, showing that there has been no pressure on the arteries. Right upper arm $1\frac{1}{2}$ in. above elbow, $6\frac{3}{8}$ in.; left upper arm $1\frac{1}{2}$ in. above elbow, $6\frac{1}{4}$ in.; right forearm 2 in. below elbow, $5\frac{7}{8}$ in.; left forearm 2 in. below elbow, $5\frac{3}{4}$ in.

DISCUSSION.

The PRESIDENT questioned whether it was justifiable to attribute such deformities to constriction by amniotic bands. He asked whether in cases of "intra-uterine amputations" the severed members had ever been discovered in the liquor amnii.

Mr. FITZWILLIAMS said he was very interested to hear Dr. Cockayne say that he knew of a reference where a limb had been amputated *in utero* by means of an amniotic band and that the limb as well as the child had been produced at birth, for as far as his own knowledge went he was under the impression that this had never been known to occur, and that modern thought inclined to the view that most if not all of these deformities were developmental errors and not due to bands at all. In the special case shown that evening by Dr. Cockayne it was quite true that, if the elbow was flexed, the constriction on the forearm and that on the upper arm were on the same level,

but that did not make it any the easier for a single band to produce both as he had suggested; for were the fore and upper arm encircled as suggested by a single band the pressure would only be seen on the outer side of each, while an actual figure of eight round the two would be necessary to produce this result. the near or opposing surfaces would otherwise escape. It was quite common for these constriction deformities to run in families, several individuals of the same generation, and several generations being affected. Several ancestries had been followed up to show this, the same deformity appearing in each. In Mr. Fitzwilliams's own experience he had known the third finger on the right hand constricted in several members of the same family, and although the deformity looked exactly as if a string had been tied round the root of the digit, it was absurd to suppose that an amniotic band was able to snare with equal tightness the same member each time. Moreover, in the severer cases of constriction whole segments were suppressed, and one could find the hands attached to the shoulders, no arms or forearms existing, giving a child a molelike appearance, and the same suppression could appear in the lower extremities. He always imagined that the true explanation of nine out of ten of the severe cases, at all events, was some developmental error. For the tenth case the amniotic band might quite possibly exist.

Dr. COCKAYNE, in reply, said that the condition was perhaps more likely to be due to a double loop of the umbilical cord, in view of the fact that no amniotic bands were seen at birth. In cases of multiple amputations of fingers, thin bands uniting the tips of other fingers to the amnion were not uncommon. In answer to Mr. Fitzwilliams, cases were known in which the amputated extremity had been found in the liquor amnii. Such were two cases described by Chaussier and Watkinson.¹ In the former a hand and in the latter a leg was found. Theodor Landau described and figured an acardiac acephalic foetus, in which a very small head was found implanted on the amnion. He supposed that this was amputated by the umbilical cord and then grafted on to the amnion. A. Owen² described a case in which the cord was found deeply embedded in the tissues of the arm just below the insertion of the deltoid. The arm below this was about half the size of the other and was livid and putrescent.

¹ Quoted in Kirrison's "Handbook of the Surgery of Children," 1910, edited by J. Keogh Murphy, p. 193.

² *Berl. klin. Wochenschr.*, 1909, xlii, p. 55.

³ *Prov. Med. and Surg. Journ.*, Lond., 1851, p. 573.

Hemiplegia with very Extensive Nævus.

By E. A. COCKAYNE, M.D.

THE child is a girl, aged 1 year 4 months. The birth was easy, but the nurse said the child was "born in convulsions." The mother attributes the condition to her having seen a cripple with a very large birth-mark when she was three months pregnant. The mother noticed the nævus at birth, but is not sure whether the hemiplegia was present then or came on later. It was first noticed after the child had had a severe left-sided fit at the age of 6 weeks. She has had similar fits at intervals up to the age of 1 year; at 8 months she had nine in two days. There has been some "shaking" of the left arm. The child appears to be quite intelligent and is beginning to talk. There is complete left hemiplegia with spasticity of the arm and leg, and the left side, including the face, is noticeably smaller than the right. The bones are seen by X-rays to be shorter on the left side. There is very extensive port-wine staining of the skin of the scalp, face, arms, legs, and part of the trunk. It is fairly symmetrical and follows a posterior root distribution. The areas of skin supplied by the first dorsal and the fourth to eleventh dorsal nerves inclusive are completely free, but almost all the rest of the body is more or less involved. Wassermann's reaction is negative.

Dr. COCKAYNE said that there was a theory that nævi of this type were due to a toxic or infective lesion of the posterior roots, and hemiplegia might be due in some instances to an encephalitis. He wondered whether in this case they could both be due to the same cause. Against it was the fact that though these nævi were so common, paralyses were seldom or never met with in association with them. He thought the difference in size of the two sides of the child was undoubtedly due to deficient development of the left side and not to hypertrophy of the right side due to the nævoid condition.

Case of Rheumatoid Arthritis in a Boy.

By J. PORTER PARKINSON, M.D.

A BOY, aged 5 years, has had "growing pains" all his life, and for the last year has been under a doctor for pains in the limbs, and has been in bed on and off since June this year. He had bronchitis at the age of 2 years, and measles last Christmas. The mother suffers from "rheumatism."

In July, on admission to hospital, he was pale and thin, with wasted muscles. The knees, ankles, wrists, and elbows were swollen and spindle-shaped, with soft, pulpy swelling. They were slightly tender on manipulation, but did not creak. No evidence of intra-articular fluid. The other joints presented nothing abnormal. Enlarged glands could be felt in the axillæ and groins, but the spleen could not be felt and showed no evidence of enlargement. Chest and abdomen *nil*. Teeth good; no evidence of gastro-intestinal derangement. Weight, 2 st. 1 lb. Wassermann's and von Pirquet's reactions normal. Temperature, 98° to 99° F., occasionally up to 100° F. He was treated by massage, &c., a course of arsenic internally, and, later, by rectal injections of polyvalent anti-streptococcus serum without effect.

He left the hospital at the end of July, and on re-admission in October, in addition to the conditions described above, there were spindle-shaped enlargements of all the joints of the fingers and slightly of the metacarpo-phalangeal joints of both hands, and the left hip-joint had become fixed in partial flexion. He was somewhat thinner and his general condition was worse. X-ray photographs of the joints were shown. It was proposed to try a course of radium water.

DISCUSSION.

Mr. W. J. MIDDLETON said that since the wide publication of the work of the Radium Institute in the lay Press he had been frequently questioned by patients anxious to try the remedy. He related his experience in two cases. (1) A lady, aged 71 years, desired him to take steps to procure radium water for her. She had suffered from sciatica and fibrositis of the muscles of the thigh for several years. He wrote to the medical superintendent describing the case. A courteous reply was received to the effect that the medical man in charge had not sufficient experience of the malady to warrant a promise of a cure. The treatment might or might not do good. The charge was 18 guineas for a bottle of water six days a week for six weeks. The patient declined to pay. (2) Two and a half years ago a patient had consulted him for early rheumatoid arthritis and had completely recovered under treatment by means of continuous counter-irritation; so much so that she was able to do her own housework and sick nursing as well. She stated that she had kept well on the whole, but four months ago had suffered from a severe attack of follicular tonsillitis, for which she had not consulted a qualified medical man but had "doctored herself." Also that for six months or more she had suffered from indigestion and rheumatism. On examination she was found to be well nourished and active, but the right kidney was out of place and freely movable. Under the circumstances radium water treatment was not advised.

His own chief means of treating chronic arthritis was continuous counter-irritation. For over twelve years he had practised the method recommended by Dr. P. W. Latham—viz., the application of large blisters in the neighbourhood of the cervical and lumbar enlargements of the spinal cord, subsequently keeping the raw surfaces open with savin ointment. During nearly five years he had extensively employed acupuncture and an irritant fluid containing croton oil, cantharides, and almond oil. He had a high opinion of these remedies and was of opinion that he had practically cured many cases of chronic arthritis, including rheumatoid arthritis. Even in cases where the joints and muscles had not been so favourably influenced the patients had almost invariably improved in general health, and a real disaster had yet to be recorded that could be traced to the treatment. In his opinion the fears concerning the use of cantharides were grossly exaggerated. The benefit obtained by such means, carefully and correctly carried out, was very lasting.

Dr. WHIPHAM referred to the beneficial effects of Bier's bandages in these cases. They were useful for a time, at all events, in checking the pain and in rendering the movements of the joints more free. They did not, however, cure the disease, and until the cause was known the only thing to do was to treat these cases on general principles. In his experience these cases did not do well. Under different forms of treatment he had seen them improve for a time, but eventually they became worse and died from some pulmonary or other trouble. This would account for the fact that examples of the disease were but seldom met with in early adult life.

Dr. CAUTLEY regarded special modes of treatment of this disease as of comparatively little curative value. There was too great a tendency to ascribe to the measures adopted results which were really due to other factors, such as rest, diet, freedom from worry, and the psychical stimulus of new methods of treatment. No doubt there were many varieties of arthritis included under the name of "rheumatoid arthritis," and some of these, perhaps dependent on definitely ascertained sources of microbial infection or toxæmia, were curable by efficient treatment of the exciting cause. The present case, with its spindle-shaped joint swellings, was to his mind a typical instance of the type to which the name "rheumatoid arthritis" might be limited. In his experience such cases ran an indeterminate course, periods of exacerbation being succeeded by considerable temporary improvement. Hence arose the illogical conclusion in many cases that the improvement was due to the special treatment adopted. Personally, he attached the greatest importance to maintaining and improving the general health and to symptomatic treatment. Perhaps, in time, the actual basic factor of the disease would be discovered and better measures would be elucidated. The relief of symptoms must be distinguished from the cure of the disease.

Dr. F. PARKES WEBER said that one of the most serious complications which could occur in such cases was actual ankylosis of one or more joints. This supervened during a recurrent attack in the case of a boy under his care, who at one time appeared to have practically completely recovered.

Neoplasm of the Sigmoid Flexure.

By J. PORTER PARKINSON, M.D.

THE specimen comes from a boy, aged 5 years, who was healthy till whooping-cough four months ago. One brother and the maternal grandfather died of consumption. In the middle of June he began to complain of abdominal pain and tenderness, coming on in attacks and lasting two to three days, accompanied by slight diarrhœa.

He was admitted to hospital on July 17, and was then healthy-looking and well nourished. The abdomen was slightly prominent and tender on palpation. No evidence of fluid. In the right lumbar iliac region was a moderately distinct mass the size of an orange and rounded, very movable, and tender on palpation. Percussion note over it was slightly impaired. Nothing else abnormal could be made out in the abdomen or elsewhere. The stools were normal. Temperature slightly raised, as a rule to 99·6° F., but occasionally rising to 101° F. without obvious reason; on September 10 the temperature rose to 104° F. and the child was obviously worse, the abdomen more tender and distended with flatus. The temperature then rose daily to 103° F. and on September 29, after several motions containing large quantities of blood, the child died. During the two months in hospital the child lost 3 lb. in weight.

At the necropsy the abdominal lump was found to be a distended sigmoid colon lying in the right iliac fossa and adherent to the adjacent small intestine. The walls of the sigmoid were much thickened with hard, whitish growth, the inner surface being ulcerated and no trace of mucous membrane visible. The walls measured about $\frac{1}{4}$ in. in thickness. The external surface was smooth. There was no constriction of the gut. All the other organs were normal. A microscopical section of the wall of the sigmoid shows largish, rounded and tailed cells packed in the meshes of fibrous tissue alveoli. In some parts this is replaced by a granular, structureless, apparently colloid substance taking the stain badly. It is, I think, a carcinoma.

The case recalls a case of cancer of the large intestine and peritoneum shown by me in 1903,¹ occurring in a girl, aged 12 years, but the present specimen appears to be unique at this age.

¹ *Rep. Soc. Study Dis. Children*, 1903, iii, p. 225.

Three Cases of Under-development.

By T. R. WHIPHAM, M.D.

Case I.—A rickety boy, aged 2 years 3 months, the fourth child in a family of five; the others are living and said to be healthy. The patient was a full-term child and was fed at the breast for six months. He was then given cow's milk and water, but he did not thrive, and subsequently Nestlé's milk and Ridge's food were tried. He sat up at the age of 6 months, but has never walked. The first tooth was cut at the age of 2 years (?). He is said to have talked at an early age, but



Case I.—Rickety dwarf, aged 2 years 3 months, with a normal child of the same age.

he speaks very seldom and indistinctly. The child is very undersized, being only 2 ft. high, which is 9 in. below the normal and less than the average for a child of 6 months. His weight is 11 lb., or 1 st. 8 lb. below the normal. Circumference of head, 17 in. (normal, 19 in.); of chest, 15 in. (normal, 19 in.); of abdomen, 17 in. The epiphyses are

slightly enlarged, and there are definite signs of rickets in the chest and a marked kyphosis in the lower part of the spine. The anterior fontanelle is open and the patient has seven teeth instead of the full complement of fourteen. The liver is slightly enlarged and the spleen can be felt below the costal margin.

Case II.—A boy, aged 8 years, of diminutive stature, but well proportioned and intellectually bright. Height, 2 ft. 9 in. (normal, 3 ft.



Case II.—Infantilism: Boy, aged 8 years, with a normal boy of the same age

11 in.) ; weight, 1 st. 8½ lb. (normal, 3 st. 13 lb.) ; circumference of head, 18⅞ in. (normal, 20½ in.). The patient was a full-term child and has eight brothers and sisters, five older and three younger, all of whom are of average size. He presents no signs of rickets, but suffers from tuberculosis of the skin and the bones of the left forearm. The urine is normal and does not contain albumin. He has been treated with thyroid extract and more recently with polyglandin. During the last six months he has grown 1 in. and has increased 2½ lb. in weight.

Case III.—A girl, aged 18 years, showing signs of hypothyroidism. The patient has been noticed to be small since the age of 7 years, and now has the development of a girl aged 10, her height being 4 ft. 1½ in. (normal for her age, 5 ft. 2½ in.), and her weight 4 st. 10¾ lb. (normal, 8 st. 9 lb.). In early life she is said to have had “marked rickets”; the chest still shows a rosary and the head is square. The features are somewhat coarse. Her skin has always been dry and harsh,



Case III.—Hypothyroidism: Girl, aged 18 years, with a well-grown girl of the same age.

and formerly she had definite pads in the neck. Her hair, on the other hand, has always been fine, but lately it has lost its gloss. Movements have always been slow and the patient suffers from the cold in the winter time. There is an absence of mammary development, also of both pubic and axillary hair, and menstruation has not yet occurred.

The girl has attended school, but was not quite up to the normal standard and her memory is not good. She had no treatment until she was 12 years of age, when she was given thyroid extract for about a year. She has three sisters, all of whom are normal.

Enlargement of the Liver and Spleen associated with Jaundice.

By T. R. WHIPHAM, M.D.

THE patient is a girl, aged 6 years, who was born jaundiced. The colour was "green-yellow," and the condition lasted for six weeks. Since then no jaundice had been noticed until February of this year, when the icterus again appeared suddenly. There was epistaxis and the jaundice gradually became more marked. When the patient was first seen in May she was deeply jaundiced, being of an olive-green-yellow colour all over. The liver was greatly enlarged, reaching to the umbilicus, and the spleen was also of a considerable size, extending down to nearly the same level, but not to the middle line. The blood count at this time showed: Red corpuscles, 4,824,000 per cubic millimetre; white cells, 15,200 per cubic millimetre; polymorphonuclears, 39 per cent.; lymphocytes, small, 53 per cent.; lymphocytes, large, 6 per cent.; eosinophiles, 2 per cent. No myelocytes nor mast cells seen. The motions were brown or yellow in colour—not acholic; but the urine was deeply coloured and contained bile pigment. The Wassermann reaction was negative. For over three months the child continued deeply jaundiced and presented no further symptoms. During the last two months, however, the jaundice has gradually been getting less and now only a faint coloration remains. The liver at the same time has decreased in size until its lower edge is $1\frac{1}{2}$ in. above the umbilicus. The spleen, on the other hand, is a trifle larger.

A recent count shows a change in the blood-picture. There are now: Red corpuscles, 2,360,000 per cubic millimetre; white cells, 38,000 per cubic millimetre; polymorphonuclears, 50 per cent.; lymphocytes, small, 28 per cent.; lymphocytes, large, 4.7 per cent.; myelocytes, 13.3 per cent.; eosinophiles, 3.7 per cent.; mast cells, 2.2 per cent. Nucleated red corpuscles are present and a few of the myelocytes contain eosinophile granules. Hydropic degeneration of the nucleus is frequent, especially in the myelocytes and large lymphocytes. The

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urine is still pigmented and contains bilirubin, but no urobilin. The child is obviously anæmic and a hæmic bruit can be heard over the base of the heart.

There are two other children in the family, one older than the patient and one a baby, and both are healthy. There is no history of syphilis.

The diagnosis of the case has presented some difficulty. It was thought at first to be a case of splenomegalic cirrhosis, acholuric jaundice having been excluded by the presence of bilirubin in the urine. The recent change in the blood-picture, however, points to the assumption that the case is an early one of myelogenous leukæmia—early, that is to say, in so far as the blood changes are concerned. If this is so, the case seems to afford evidence that in this disease the visceral changes become evident at an earlier stage than those in the blood. As frequently happens in this class of case, the cause of the attack of jaundice is obscure.

The exhibitor showed a previous case of myelogenous leukæmia in an infant, aged 18 months, in 1910.¹

Dr. F. PARKES WEBER said that the possibility of leukæmia being present in Dr. Whipham's case negatived any idea of operative interference (splenectomy) for the present, an idea which might otherwise be considered.

Congenital Insufficiency of Ocular and Facial Movements.

By LEONARD GUTHRIE, M.D.

Boy, aged 4 years, born at full time and labour easy. Imperfect closure of the eyes was noticed at birth, and also that his face was devoid of expression. His mother states that "he has never been known to smile."

Present condition: Intelligence normal, speech somewhat defective, general nutrition and development fair. The whole of the face is motionless as far as the mouth; the skin of the face is smooth and not tightly stretched. The visage resembles in some respects the "myopathic facies." The eyes cannot be fully closed, the eyeballs are in mid-position, and the only ocular movements which can be performed are elevation and convergence, downwards and inwards. The pupils are equal, active to light, less so on accommodation. When crying, tears are

¹ *Proceedings*, 1910, iii, p. 92.

shed, but no facial contortions are visible; laughter is only represented by guttural grunts. The upper lip projects slightly and is flabby; the lower lip is not everted as in myopathy. The orbicularis oris is not paralysed, for he can purse his lips and also blow out his cheeks, though feebly. The escape of the orbicularis oris is probably due to association of its action with that of the tongue, the movements of which are normal. Movements of the palate and masticatory muscles are also normal. Electrical reactions cannot be obtained in any of the facial muscles except the orbicularis oris.

The condition is regarded as an unusual form of myopathy affecting muscles supplied by the third and seventh nerves.

DISCUSSION.

Dr. F. PARKES WEBER said he would like to know whether any of the published cases of *congenital external ophthalmoplegia* had been associated with facial paresis.

Dr. GUTHRIE said it was difficult to imagine that the condition was due to congenital affection of the ocular and facial nuclei or of their nerves. The more probable diagnosis was congenital myopathy of the Landouzy-Dejérine type. It was true that the ocular muscles usually escaped in that affection, but there was no reason why they should do so. Congenital absence or imperfection of ocular muscles was not uncommon, and might be regarded as an isolated form of a more widely spread myopathy. As far as he could ascertain, no case similar to the one now shown had been recorded.

A Case of Cretinism.

By FREDERICK LANGMEAD, M.D.

G. M., A FEMALE baby, aged 5 months. The patient is a firstborn child whose mother is aged 30 years and father aged 25 years. There is no history of thyroid disease in the family. The appearance is characteristic: the features are pale, coarse, and bloated, the eyes puffy, the lips thick and the tongue large and broad. The build is of the usual thick-set, short-necked, bloated form, the abdomen being prominent. The hands and fingers are broad. The hair is sparse and dry and top of head flat; and in the back is the lumbar cushion commonly seen. No thyroid tumour is present. The child is lethargic and takes no interest in its surroundings or its food. A particularly large umbilical hernia is present, the hernial ring admitting one's thumb with ease.

The child is shown because she exhibits two features which are characteristic of Mongolian imbecility rather than of cretinism: (1) Markedly incurved little fingers; (2) congenital morbus cordis. A definite systolic murmur can be heard to the left of the manubrium. It is not accompanied by symptoms. It is open to question whether the murmur may not be ascribed to the anæmia, but the wide area over which it is heard and its intensity favour the view that the lesion is organic.

Case of (?) Cerebellar Encephalitis.

By E. BELLINGHAM SMITH, M.D.

A. S., AGED 8 years, was admitted into the Queen's Hospital for Children on July 26, 1913, as a case of cerebrospinal meningitis. The history states that on July 25 the boy was suddenly taken ill with headache, vomiting, and pains all over the body. On admission on the following day the boy was drowsy, the face was flushed, there was distinct rigidity of the neck muscles, and some retraction of the head. The abdomen was retracted, all the reflexes were exaggerated, and the plantar reflexes were extensor in character. Kernig's sign and ankle clonus were well marked. The temperature was 103° F., and the pulse varied from 68 to 88. Lumbar puncture, performed the day after admission, revealed a turbid fluid, not under pressure, containing 0.075 per cent. albumin; globulin, a small precipitate. Glucose present, and a great number of polynuclear cells and large lymphocytes. No organisms were seen and the cultures were sterile.

On July 29 his condition was unchanged except that plantar reflexes were flexor and the heart very irregular.

On August 8 there was some commencing optic neuritis, and the head retraction had disappeared. Temperature was still raised and the pulse rapid and regular.

On August 17 the child was still rather drowsy, and condition still unaltered. Blood count and blood cultures were respectively normal and sterile. Widal's reaction was negative.

On August 19 the child could answer questions and complained of headache.

On August 21 the optic neuritis was well marked.

On September 4 lumbar puncture gave a turbid fluid; albumin,

0.35 per cent.; globulin, thick precipitate; glucose absent. In the films a moderate number of polynuclear leucocytes. Cultures sterile.

On September 9 the temperature was still raised; the child was very wasted, and complained very much of headache, but his condition permitted of a more thorough examination. The reflexes were exceedingly brisk throughout, and equal on both sides of the body. Plantar reflex, flexor; ankle clonus well marked. There was no paresis of limbs, but on getting him to move his arms or legs there was some ataxia. This incoördination was equally marked on both sides of body. There was no facial or eye paralysis and no nystagmus, and no alteration in sensation. Hearing was indifferent on both sides, but the right hearing was distinctly more imperfect than the left. Optic neuritis present and more marked on the right than on the left. On getting the child to sit up, he did so with difficulty and a swaying movement; when supported in this position his head assumed an attitude with face turned upwards and to the left and right ear down to right shoulder.

September 10: Patient was given phenazone bromide and liq. trinitrini for headaches, which were very severe, but with no improvement. General condition getting steadily worse.

On September 15 pot. iodide in 5-gr. doses was given t.i.d., and on September 20 the temperature, which had hitherto been continuously raised, suddenly became normal. Similarly, his headaches, after a slight attack on September 18, were no longer complained of.

On October 3 he could walk, but with a tendency to lurch to the right. There was slight ankle clonus to be obtained on the left side, otherwise reflexes were normal.

On October 9 the optic neuritis was less marked, the child could run about the ward and seemed quite well, and is now rapidly gaining weight.

The interesting and outstanding feature in this case appears to be the almost immediate relief of all symptoms shortly after the administration of iodides.

Dr. CAUTLEY thought it hardly probable that the case was one of polio-encephalitis of the same type as poliomyelitis. It was not rare for sporadic cases of basal meningitis to continue for several weeks and on recovery to leave various sequels, such as deafness, ataxia, tremor, rigidity, &c., not necessarily permanent. The optic neuritis was in favour of such a diagnosis, and the almost complete recovery of the child, together with absence of any paralysis of cranial nerves, was strong evidence against polio-encephalitis. It was unlikely that such a prolonged attack of meningitis could occur without encephalitis, and possibly this was most marked in the cerebellum.

Case of Infantile Paralysis of Early Onset, with Unusual Deformities.

By E. BELLINGHAM SMITH, M.D.

A. H., AGED $1\frac{1}{2}$ years, brought to the Queen's Hospital for Children on September 3 for paralysis of both legs and left arm. The mother states that the child was quite well until 2 months old, when he was vaccinated. A few days later the child seemed very unwell and was unable to move the left arm or either leg. Ten days later the child was taken to the Evelina Hospital. He has since been to other hospitals, but the condition has not improved.

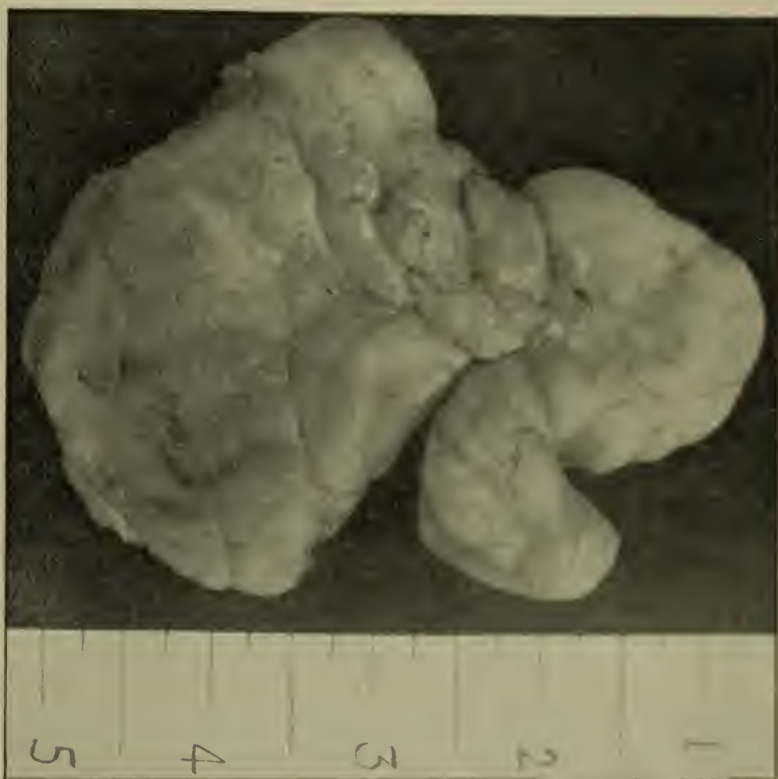
The child is a fairly well nourished baby, but is quite unable to sit up and usually lies with both legs flexed at knee and markedly abducted at the hip-joint, so that the thighs lie at right angles to the pelvis. The left leg can be readily brought down into a direct line with the trunk, but the right is incapable of complete inward rotation and adduction. The knee-jerks are absent on both sides. The plantar reflex is absent on the left and extensor (infantile type) on the right. The abdominal reflexes are sluggish on the right, absent on the left. The paralysis of the muscles of the left lower limb appears to be fairly general throughout. In the right leg the affection appears limited to the adductors and extensors in thigh and most of the muscles in the leg. Electrically the muscles of the right leg are said to react normally, while those on the left side show a marked diminution to both galvanism and faradism with A.C.C. > K.C.C. In the left upper extremity there is some wasting of the biceps and triceps group and a diminution in response to both faradism and galvanism.

X-ray plates of the limbs of this child show a dislocation or subluxation of the left hip-joint, not congenital in origin, an old greenstick fracture of the lower end of the left femur, and a curious swelling of the shaft of right femur, just below the great trochanter. Dr. Salmond, who took the X-ray plates, reports that there is throughout the limbs a tendency for most of the bones to show a cystic structure.

Extra-pleural Lipoma from a Child, aged 6 Years.

By DUNCAN C. L. FITZWILLIAMS, F.R.C.S.

THIS child was shown to the Section on January 24¹ of this year as a case of lymphangioma, resembling a hernia of the lung. The general opinion expressed at the meeting was that the condition was a true hernia of the lung. A truss was devised, which the child wore for some



Extra-pleural lipoma from a child aged 6 years.

months. The swelling gradually became larger, and in September the child was operated upon and the lump exposed. It proved to be a pure lipoma with very little fibrous tissue. The portion in the neck communicated by a narrow neck passing down behind the subclavian artery with a much larger portion which lay within the thorax outside the parietal pleura. The tumour was extremely soft, practically fluid oil at the body temperature, and coughing easily impelled most of the intra-thoracic portion into the neck. The tumour was removed whole. A photograph of the specimen is shown: the inch scale enables the actual size to be estimated.

¹ *Proceedings*, 1913, vi, p. 99.

Case of a Boy, aged 5 Years, with Two Femoral Herniæ.

By DUNCAN C. L. FITZWILLIAMS, F.R.C.S.

THE child was brought to hospital on account of an inguinal hernia. On examination he was found to suffer from asthma and a chronic cough, he had enlarged tonsils and a considerable amount of adenoid tissue in the posterior nasopharynx. On coughing, the inguinal hernia came down readily, but there was seen in addition well-marked bulging below the inguinal ligament (Poupart's) on both sides. Gurgling was occasionally felt on replacing the swellings. The tonsils and adenoids were removed and the inguinal hernia operated upon. The femoral herniæ were left untouched. For the last six weeks his cough has been less frequent, and the femoral herniæ appear to have become very much smaller.

Case of Cephalhæmatoma.

By DUNCAN C. L. FITZWILLIAMS, F.R.C.S.

BABY, aged 3 weeks, with a very large cephalhæmatoma on the right parietal region. A ring of hard blood-clot is felt all round the edge. There is no pulsation. The mother states that the size of the swelling has increased during the past few days. The child is the youngest of three; the other two never had anything the matter at birth. The labour was normal; no instruments were used.

Specimen of Diphtheria of Trachea and Bronchi.

By J. D. ROLLESTON, M.D.

GIRL, aged 5 years, was admitted to hospital on June 20, 1913, with severe faucial and laryngeal diphtheria on fourth day of disease. Tracheotomy performed on admission. Some relief followed operation, but the tube remained dry. The respirations were between 48 and 62, and pulse between 130 and 150; temperature, 102° to 101° F. There

were numerous small stools. Death took place somewhat suddenly on June 22.

Specimen shows membrane closely adherent to the posterior surface of the epiglottis and interior of the larynx, from the lower end of which a thick continuous tubular cast extends to the bifurcation of the trachea and passes into each of the bronchi.

Dr. ROLLESTON added that though the case was by no means unique, it was unusual to see so good a specimen of diphtheria of larynx, trachea and bronchi, especially after tracheotomy. Although forceps were passed down the trachea on the day following the operation, the presence of the cast was not detected. The case was one of exceptional severity and was little affected by large doses of antitoxin: 20,000 units were given on admission and 12,000 on the following day. The membrane could be traced to the finest ramifications of the bronchi.

Notes of a Case of Anomalous Development.

By F. G. CROOKSHANK, M.D.

H. G., FEMALE, was born on August 17, 1913, of healthy parents who have had previous offspring⁴ free from all congenital defect. It was noticed that the lower part of the dorsal spine was protuberant, and it was thought that a spina bifida was present. The infant, when a fortnight old, was seen by me, and it was then obvious that there was a grave defect of what should have been the spinal column in the lumbar region. The lower limbs were small, immobile, and presented webbing between the thigh and the calf. A skiagram taken at this time showed absence of the lumbar vertebræ, and a very imperfect condition of the pelvis. The infant was admitted into the Belgrave Hospital, where she died on October 1, 1913. The legs had not grown since birth, although the rest of the body was in fair proportion.

At the post-mortem examination it was found that the spinal column terminated at the twelfth dorsal vertebra in a bony boss of small size. The spinal canal was completely closed. There were twelve pairs of dorsal nerves, but no lumbar nerves at all; and the legs were, seemingly, not innervated. A very rudimentary sacrum and coccyx were present, though the only trace of a lumbar spine was represented by the continuity between thorax and pelvis of a fibrous band apparently indicating the anterior vertebral ligament. No other abnormality was found.

It is beyond dispute that the mother of H. G. had been, for several months before and after the date of H. G.'s conception, in close daily association with a little boy, paralysed as the result of Pott's disease, who died when Mrs. G. was four months pregnant. Mrs. G. and this little boy are stated to have been greatly attached to each other.

Some references to cases of anomaly of the vertebral column may be found in the *Revue d'Orthopédie*, July 1, 1912, and *La Presse Médicale* for October 5, 1912.

I am obliged to Dr. Wanklyn and to Dr. McCrory (Inspector of Midwives) for having brought the case to my notice.

Section for the Study of Disease in Children.

November 28, 1913.

Dr. LEONARD G. GUTHRIE, President of the Section, in the Chair.

[Case of Recrudescent Rickets with Tuberculosis and Infantilism.

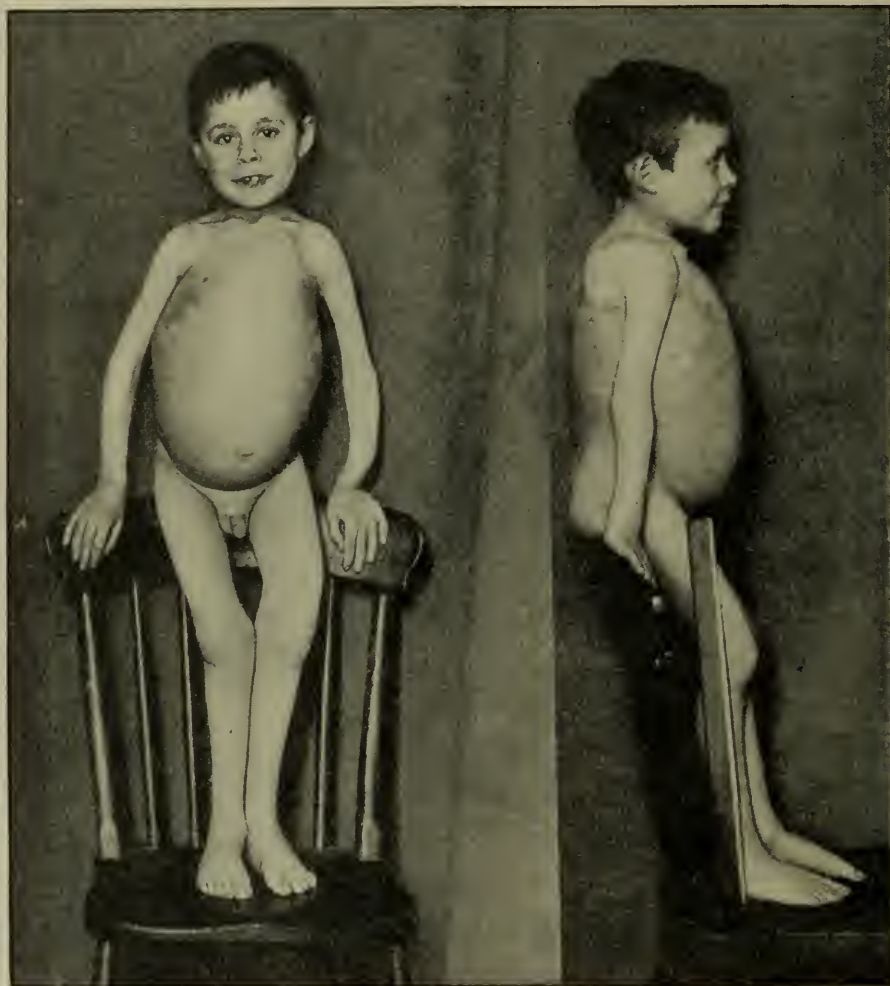
By C. E. ZUNDEL, M.D.

J. N., BOY, aged 14 years, came under observation in June, 1913, with the history that for eight months he had been confined to bed with pains in the legs, weakness, dry cough, and frequent perspiration.

Previous history: He is the third child of a family of five, three of whom are dead. He was born at full time and was breast-fed. Former hospital records show that at the age of 7 years he was treated as an out-patient and then as an in-patient. At that time he was described as "Very undersized and with marked rickets." There was a history of five years' frequent attacks of diarrhœa and vomiting, and of five months' transient œdema of the feet. While an out-patient and also as an in-patient Bence-Jones albumosuria was present on twelve occasions. At the age of 10 years he was again admitted to hospital, on this occasion with tetany, and X-ray examination after a bismuth meal showed that the stomach was greatly dilated. The scars of femoral osteotomies were noted on this occasion. No albumose was detected in the urine. At the age of 11 years the boy was admitted to Brompton Hospital, where he remained for nine months. During this time his abdomen was "tapped" on six occasions. On his discharge there were some signs suggestive of pulmonary tubercle, ascites was present, and his weight was 2 st. 13 lb. He was able to run about without difficulty or pain. He was discharged from Brompton Hospital eighteen months ago, and apparently was well till twelve months ago. Then he began to complain of some pain in the legs and of difficulty

in walking. When he was admitted to the Seamen's Hospital under Dr. Guthrie Rankin in June, 1913, he had been unable to walk for six months, and for two months painless deformity of the forearms had been noticed.

Condition on admission: Childish appearance, much undersized, puny limbs and "frog-belly." Height, 3 ft. 4 in.; weight, 2 st. 11 lb.



Recrudescent rickets with tuberculosis and infantilism.

(The rod in the right-hand figure is 18 in. in length.)

Marked deformities of the forearms were present, due to recent fractures: these were multiple (four in right limb and two in left), complete, transverse, painless, and showed little tendency to callus formation. X-ray examination showed that the bones were unduly light in texture, and that the shell of compact bone of the shafts was very thin; the appearance of the epiphyseal regions was cloudy and many centres normally

present at his age were absent. He showed a rickety rosary but no head deformity. The limb muscles were small and feeble, but their response to electrical stimulation was normal. The child was quite unable to stand without support. There was some broncho-pneumonia and considerable ascites. At no time during the last three months has there been any pyrexia. Intelligence is good but his education is rudimentary. Wassermann's reaction is negative. No enlargement of the thymus is apparent.

Subsequent course: The boy has been treated with rest, massage, and ol. morrhuae. He can now walk 100 yards alone, and a recent skiagram shows that considerable development of the epiphyses has occurred at wrists and elbows. His weight remains 2 st. 12 lb., which is practically what it was eighteen months ago, but owing to the presence of ascites the weight may not be a true index of his general condition.

DISCUSSION.

Dr. ZUNDEL added that the child was under the care of Dr. Guthrie Rankin, to whom he was indebted for permission to bring the case before the Section. The diagnosis of "recrudescent" rather than "late" rickets was made advisedly in view of the fact that there was a definite history of rickets in early life, then apparently a period of remission followed by a fresh and marked manifestation of the rickety process, occurring as a sequel to, and possibly induced by, the occurrence of tubercular peritonitis.

Dr. F. PARKES WEBER thought that in some cases of so-called "recrudescent rickets" associated with infantilism the development of the epiphyses and osseous system might be so infantile that the rickety changes were really only such as might be present in ordinary rickets of much younger children whose epiphyses and osseous system were at a corresponding early stage of development. In other words, the undeveloped state of a child's epiphyses and bones was sometimes sufficient to explain the lateness or recrudescent of so-called late or recrudescent rickets.

Dr. ZUNDEL, in reply to the President, said that estimation of the calcium metabolism had not yet been made. Though the child was evidently now in a "sub-tetanoid" condition, he had not had tetany for four years till an attack occurred a few days ago. In reply to Dr. Parkes Weber, he said it was difficult to bring forward any evidence for or against the hypothesis that the present rickety manifestations were simply those which might be expected at the early age to which the child's present markedly infantile condition would correspond.

Cases of Bilateral Congenital Hip in Twins.

By F. G. CROOKSHANK, M.D., & LIONEL E. C. NORBURY, F.R.C.S.

G. H. AND W. H., females, aged 8 years 11 months. In each case there is marked displacement of the head of the femur on to the dorsum ilii on either side. There are seven other children in the family, six older and one younger, but these exhibit no malformation.

Dr. CROOKSHANK, in the absence of Mr. Norbury, said that he understood suggestions for the surgical treatment would be appreciated. Apparently the children were the joint products of one ovum; and therefore unless the operation at a later date of some factor affecting both embryos identically could be assumed, it must be thought that the conditions determining the deformity existed at the time of fertilization. As the father was said to have been, at the time of the conception, in an early stage of general paralysis, it might be thought that the spermatozoa were then somewhat damaged. Cases of similar deformities in twins were not very common. Professor Windle collected some instances¹ a few years ago, but so far no twin cases of this precise nature had been found on record.

Case of Nervous Cretinism.

By F. G. CROOKSHANK, M.D.

E. H., FEMALE, now aged $5\frac{1}{2}$ years, was in August, 1912, brought to see Dr. H. Carlyll at the Belgrave Hospital. The notes then made state that the child had spoken early but walked late; that the present complaint was one of slime coming from the mouth, of stumbling and of being miserable. It was recorded that the skin was harsh, the gait tottery, the knee-jerks increased. A diagnosis of "xerodermia with (?) hypothyroidism" was made, and small doses of thyroid were given. Subsequently, I saw the child irregularly: little change if any for the better occurred, and the speech became defective. In the spring of this year, after the demonstration by Dr. Langmead of his case of "Nervous Cretinism,"² it occurred to me that this was one of the same character. The gait then was more than ataxic; it was that of a child

¹ *Journ. Anat. and Physiol.*, 1892, xxvi, p. 295, and 1893, xxviii, pp. 25-45.

² *Proceedings*, 1913, vi, p. 149.

with "ataxic paraplegia." The dose of thyroid was quickly increased and regularly maintained, and the child now walks and talks well, and has lost almost all her symptoms. She is growing fast.

DISCUSSION.

Dr. CROOKSHANK said that this case was one of six or seven that he had lately had under observation, but that he had selected this particular one for exhibition, since the original diagnosis of hypothyroidism was made by another.

Dr. LANGMEAD said that he did not wish to claim priority in the description of a condition called "nervous cretinism." He had been attracted by a paper by Major McCarrison, who, during his researches on endemic cretinism in Northern India, had found that a third of the cases he studied had a condition which from the description he gave corresponded to what is generally known as "spastic diplegia." He (Dr. Langmead) had shown a case in which undoubted cretinism was associated with spastic paraplegia merely to draw attention to this work. He was glad to find that his attempt had borne some fruit, and that Dr. Crookshank was able to produce further evidence of the possible rôle of the thyroid gland in this connexion.

Dr. F. PARKES WEBER asked for information on the pathological anatomical findings in the class of cases of nervous cretinism referred to. He thought that recent work as to the possible effects of absence of vitamins from the food in regard to the development of certain nervous troubles (for instance, experimental beri-beri) made it probable that general nutritional defects, connected with cretinism, might favour the onset of spastic parietic symptoms in the lower extremities.

Dr. CROOKSHANK, in reply, said he did not gather that Major McCarrison, or anyone else, had suggested that all cases of cerebral diplegia in children, or even most, were to be cured by thyroid substance; but rather that apparently a certain number of cases of cerebral diplegia were definitely associated with dysthyreosis. The patient shown that afternoon could hardly walk seven months ago, and the speech was unintelligible; now the child was well. In this connexion it was interesting to note that Chagas, the discoverer and investigator of the parasitic thyroiditis of Brazil, had shown that, where this thyroiditis was endemic, cases of "cerebral diplegia" of all grades of severity—from those with merely increased knee-jerks and some ataxy up to the most marked scissor-legged cases with idiocy—were very common amongst children, not obviously cretins, but who had suffered from the specific thyroiditis. An account of these cases by Chagas himself, who has recently been in Paris, was to be found in the *Nouvelle Iconographie de la Salpêtrière* (January—February, 1913).¹ It was not suggested (for there was no evidence) that the endemic

¹ *Nouvelle Iconographie de la Salpêtrière*, Par., 1913, xxvi, pp. 1-9.

cretinism and the cerebral diplegias seen in England were parasitic; but Chagas's observations gave occasion for thought, especially when correlated with the suggestions of Dr. Parkes Weber. Dr. Crookshank said that about ten years ago he had, in private practice, the case of a little girl who, when aged about 3 years, began to develop signs of spastic palsy. After a little while some thyroid was given her, because she looked cretinoid, and her symptoms shortly after completely disappeared. The improvement in the nervous symptoms was not, however, at the time ascribed to the thyroid given. So far as he could see, the symptoms occurring in these cases of so-called "nervous cretinism" (which were not *markedly* cretinoid) fell into three groups: there were cases with choreiform movements; cases with ataxy of the legs, and cases with spasticity.

Case of Jaw-winking.

By F. G. CROOKSHANK, M.D.

THE patient, a girl, aged 9 years, has congenital unilateral ptosis. When the muscles of her face are at rest this ptosis is considerable. When she depresses her jaw or moves it sideways, not only does the ptosis disappear, but the sclerotic becomes visible on the affected side, above the cornea. The phenomenon has been elucidated by Mr. Bishop Harman in, among other papers, one appearing in the *West London Medico-Chirurgical Journal* for January, 1912.

Dr. CROOKSHANK said he would not venture to say whether either Mr. Bishop Harman's explanation or the alternative that had been put forward afforded a full and perfectly adequate explanation of these cases, but Mr. Harman's atavistic hypothesis was fascinating and reasonable.

Skiagrams of a Case of Dactylar Deformity from Amniotic Bands.

By F. G. CROOKSHANK, M.D.

THE skiagrams showed well the bony deformities, and less clearly the multiple constrictions of the fingers of a boy, from whose hands at birth, it was stated by the mother, the doctor removed a number of "strings like wires."

Case of Mesenteric Cyst simulating an Intussusception.

By PHILIP TURNER, M.S., and H. TIPPING, M.D.

L. A., AGED 4 months, was admitted to Guy's Hospital on June 14, for passage of blood from the anus. Until a week before admission the child had been perfectly well, but during this week he had been slightly irritable, had not been sleeping as well as usual, and had had several "crying fits." On the morning of admission he did not pass a good motion. In the evening blood was passed and he was taken to Dr. Tipping, who advised immediate removal to the hospital.

On admission the child did not appear to be in pain, and nothing could be felt on abdominal palpation; a rectal examination, however, showed the presence of recent blood. An anæsthetic was given and then a small movable lump was felt just below and to the right of the umbilicus. A diagnosis of intussusception was made and the abdomen at once opened. The lump was found to be a tense cyst, about 1 in. in diameter, situated in the mesentery in the angle between the ileum and the colon. It bulged into both these portions of the intestine, causing obstruction at the ileo-cæcal valve. An attempt was made to remove the cyst, but though it was easily separated from the mesentery its walls appeared to be absolutely incorporated with the wall of the ileum and cæcum. As it seemed certain that any further attempt at removal would result in damage to the bowel, the cyst was incised and a quantity of white, odourless, glairy fluid was evacuated. There was no communication between the cavity of the cyst and the bowel. The greater part of the cyst wall was cut away and the edges were then sewn to the parietal peritoneum. The cavity was drained and the rest of the wound closed.

The first motion after the operation contained blood, but afterwards the bowels acted regularly and the motions were normal. Mucoid material discharged from the wound for some time, but this eventually healed. Since then, on two occasions, incisions have been required to allow of the escape of mucoid material which has collected in the cavity. A section of the cyst wall showed a structure closely resembling small intestine.

DISCUSSION.

Mr. TURNER said that one of the most interesting points about this case was the diagnosis. The symptoms most closely resembled those of an intussusception; there was even, when the child was anæsthetized, a lump to be felt within the abdomen. Indeed, he thought, until the tumour was withdrawn from the abdominal cavity, that he was dealing with an intussusception. As regards treatment, he thought that an attempt to separate the cyst from the intestine would certainly result in tearing the wall of the bowel. He thought that the sinus still present as the result of stitching the portion of the cyst which could not be removed to the parietal peritoneum might close spontaneously. If it persisted a further operation might be carried out when the child was older. As regards the pathology of this cyst, he suggested that it might be derived from a Meckel's diverticulum, the communication of which with the intestine had become completely obliterated. The section exhibited showed the cyst to be lined by a structure indistinguishable from the mucous membrane of the small intestine.

Dr. H. D. ROLLESTON said that the case evidently belonged to the group of enteroid or juxta-intestinal cysts, which were situated near the lower end of the ileum or at the ileo-cæcal angle. Eighteen examples had been collected by Terrier and Lecène¹ who also regarded them as derived from Meckel's diverticulum; but possibly sequestrations from the ileum other than Meckel's diverticulum might give rise to these cysts.

Two Cases of Dermatitis Herpetiformis treated by Counter-irritation.

By W. J. MIDEルトN.

Case I.—C. S., aged 7 years. Born healthy. Well up to the age of 3 years, then scarlet fever. An eruption occurred after the original rash died away; not recognized at first but later pronounced dermatitis herpetiformis by Dr. P. Abraham. Measles twice and pertussis once subsequently. The dermatitis persisted. Twice admitted to West London Hospital. Free from the dermatitis from beginning of August to end of September, 1911; then recurrence, which persisted. Counter-irritation commenced by me at the end of February, 1912. At that time the pustules, blebs, and scabs were well marked, chiefly on inner aspect of upper third of thighs and spreading on to abdomen. Few spots elsewhere. Within three weeks well. Occasional slight relapses of short duration since that time.

¹ Terrier et Lecène, *Rev. de Chir., Par.*, 1904, xxiv, p. 161.

Case II.—A. H., male, aged 7 years. Whooping-cough at the age of 10 months. Measles and broncho-pneumonia at the age of 2½ years. "Weak on the chest" ever since. Present illness began in February, 1912. Attended at the West London Hospital in May, 1912. Treatment by means of continuous counter-irritation commenced in August, 1912, and has been carried out once a week ever since. By the end of December the disease became much modified and blebs ceased to form. In April, 1913, a few blebs formed but soon cleared away. From time to time there is a mild outbreak if the patient has a bad cold, but the treatment seems to check the eruption and the boy's general health has much improved.

Case of Anterior Poliomyelitis; Paralysis of Abdominal Muscles; Collapse of Lung.

By G. A. SUTHERLAND, M.D.

E. C., FEMALE, aged 15 months, was admitted in May, 1913, to a surgical ward suffering from a large abscess in back, staphylococcal in origin. Rapid healing followed operation. Eleven days later acute illness of an indefinite character followed, thought at one time to be measles. This diagnosis was not confirmed, but the temperature continued irregular; there was laboured breathing with much cough, but no marked physical signs in the lungs.

Seen three weeks after onset. Well-marked signs of broncho-pneumonia were present, bubbling râles all over both lungs and consolidation of greater part of right lower lobe. Occasional attacks of dyspnoea and cyanosis occurred. The dullness over right lung became more marked and exploratory puncture was performed several times with a negative result. Abdomen distended and great faecal accumulation. Discharged after three months' stay in hospital.

Readmission on October 1, 1913. Child wasted and rickety. Both lower extremities showed signs of former poliomyelitis. The abdomen was prominent. On coughing or crying two marked bulgings seen, one occupying the upper part (two-thirds) of right abdominal wall, and the other the lower part (two-thirds) of left side. Chest expansion was poor and there was marked sinking in of the lower ribs during inspiration. Bubbling and squeaking sounds heard over both lungs. Over the lower lobe of right lung posteriorly impaired resonance and faint breath sounds. Cough frequent and feeble.

It is suggested (1) that the pulmonary signs described above as the result of broncho-pneumonia were due primarily to massive collapse of lower part of right lung; and (2) that the collapse was due not to paralysis of the diaphragm but to paralysis of the muscles of the abdominal wall, which would have the same effect.

Case of Enlargement of the Liver with Ascites.

By J. W. CARR, M.D.

THE patient is a boy, aged $2\frac{1}{2}$ years. The only previous illness has been measles at the age of 5 months. He was admitted to the West London Hospital in March, 1913, with a history that his abdomen had suddenly begun to swell a fortnight before, but that previously he had been in perfectly good health and had had no digestive disturbance. He was found to have ascites, for which he was tapped thirteen times at intervals of from five days to three weeks, from 1 to 3 pints being drawn off each time. During this time he had an attack of jaundice, but this has not recurred. In July an attempt was made, by means of an incision in each groin, to drain the ascites into the lymphatics of the thighs, but with only partial success, although since the operation the abdomen has not refilled so quickly as before.

On September 24 the boy was admitted to the Victoria Hospital for Children, Chelsea. Since then the abdomen has only been tapped twice, on October 6 and November 21: 24 oz. were withdrawn the first time and 42 oz. the second. The fluid has the ordinary characters of a dropsical effusion. The child's general health has been fairly good and there has been no vomiting or hæmatemesis, but he has had irregular and rather severe febrile attacks for which no cause has been found.

The child is very small and rather thin, weighing about 22 lb. The superficial veins are markedly dilated between the umbilicus and the upper end of the sternum and the blood in them passes from below upwards. The abdomen contains a good deal of free fluid. The liver is greatly enlarged, reaching between 2 and 3 in. below the ribs; it is hard, not tender, and its surface feels finely granular. The spleen is not appreciably enlarged, but its lower end is sometimes just palpable. The heart and lungs appear to be healthy and the urine is normal. The

blood contains 12,000 leucocytes per cubic millimetre, more than half of which are lymphocytes.

The liver is almost certainly cirrhotic, but the cause is very obscure. The mother absolutely denies that she has ever given the child alcohol in any form. There is nothing in the family or personal history to point to congenital syphilis and the Wassermann reaction has been negative on three occasions. von Pirquet's reaction is also negative. A diagnosis of occlusion of the hepatic veins has been suggested.

DISCUSSION.

Dr. H. D. ROLLESTON had, by Dr. Carr's courtesy, examined the case on several occasions, but had not been able to feel any irregularities of the surface of the liver such as might occur in cirrhosis. He suggested that there might be occlusion of the orifices of the hepatic veins and also, perhaps, of the inferior vena cava in the immediate neighbourhood on the following grounds: The dilatation of the subcutaneous veins over the abdomen was extreme, and as the veins did not centre around the umbilicus the dilatation might well be due to caval rather than to portal obstruction. A strong argument against thrombotic occlusion of the portal vein was the absence of splenic enlargement. The extensive venous anastomosis would render an abdominal incision very dangerous from hæmorrhage, but the abdomen might be drained into the tissues of the thigh according to Mr. Handley's method.

Dr. LANGMEAD agreed with those who thought that something more than cirrhosis of the liver was present. He did not think that cirrhosis alone would account for the great distension of the superficial veins on the abdomen and chest. There was probably obstruction due to the vena cava also, possibly due to so-called multiple serositis.

Dr. CARR, in reply, said he was glad Dr. Rolleston had discussed the possibility of obstruction of the hepatic veins, for undoubtedly the absence of enlargement of the spleen was a strong argument against the existence of portal obstruction, whether due to cirrhosis of the liver or to portal thrombosis. As, however, Dr. Rolleston had stated in his work on "Diseases of the Liver" that occlusion of the hepatic veins had never been correctly diagnosed, he (Dr. Carr) hesitated to venture on the diagnosis in this case. Whether such occlusion existed or not, he did not think there was any evidence of obstruction of the inferior vena cava; there had never been any oedema of the feet and there was little, if any, enlargement of the superficial veins below the umbilicus. Dr. Sutherland had asked as to the possibility of mediastinitis, but examination of the chest showed no signs of this; the heart was not dilated, and there was no reason whatever for thinking that there were any pleural or pericardial adhesions. Dr. Cautley's suggestion of a chronic pylephlebitis was interesting, but there was nothing to point to any source of

infection and nothing in the history to indicate that there had ever been any marked gastro-intestinal disturbance. It was true the child had had irregular febrile attacks of considerable severity, for which no cause had been found, and it was just possible that they were due to some toxic process going on in the liver, but was it not also equally possible that owing to the unusually small quantity of blood which must be passing through the liver, toxins from the alimentary canal, which were normally destroyed in that organ, were able to escape into the general circulation and so give rise to fever?

Case of Osteogenesis Imperfecta, illustrating High Fever after a Fracture in which the Fragments were not displaced.

By F. J. POYNTON, M.D.

S. L., AGED 11 years. Admitted to University College Hospital on October 6, 1913, suffering from fractured left tibia and fibula. The child has been admitted three times to this Hospital, and many times to the Great Ormond Street Hospital, suffering from fractures of the legs. It takes a very slight blow to break them, and this time the fracture was caused by a blow from the fist of a child. Her bones have been soft and easily broken from birth, and she has never been able to walk alone. *The case is shown to illustrate the fever that may occur with the occurrence of fracture not sufficient to disturb the fragments.* In this case the temperature rose to 103° F. and kept up, with general malaise, for nearly a week.

Dr. J. D. ROLLESTON said that Mr. Sydney Stephenson had drawn his attention to the blue sclerotics of this child, the hereditary transmission of which he was the first to describe in this country,¹ though Peters, of Rostock, had previously recorded cases in four generations.² Dr. Poynton's case might be regarded as an example of the interesting association of blue sclerotics and brittle bones of which he (Dr. Rolleston) showed a case before this Section in March, 1911,³ in a congenital syphilitic infant whose mother, aunt, and maternal grandmother had a similar condition of the sclerotics. At the time when he showed this case the child had had a fracture of the humerus only, but in 1912 it fractured both its tibiae, one within a month of the other. This subsequent history was noteworthy as Peters, in a recent paper,⁴ seemed inclined to

¹ *Ophthalmoscope*, 1910, viii, p. 330.

² *Klin. Monatsbl. f. Augenheilk.*, Stuttg., 1908, N.F., v, p. 130.

³ *Brit. Journ. Child. Dis.*, 1911, viii, p. 202.

⁴ *Klin. Monatsbl. f. Augenheilk.*, 1913, li, p. 594.

doubt whether this case was really an example of association of blue sclerotics with brittle bones. Shortly after the publication of Dr. Rolleston's case another member of the Section, Mr. Harold Burrows, described a family in which the association of blue sclerotics with brittle bones occurred in several generations.¹

Case for Diagnosis. Congenital Morbus Cordis or Erythræmia (?).

By F. J. POYNTON, M.D.

V. P., AGED 5 years.

Family history: Father and mother healthy; three children—a boy, aged 6 years, healthy; the patient; and a girl, aged 3½ years, healthy. No miscarriages; no deaths; no family history of rheumatism or of tuberculosis.

Personal history: Patient was a full-time, healthy child. Bottle-fed. She seemed all right until she had diphtheria at the age of 1½ years, and required a tracheotomy. She has never gained flesh since then—i.e., for three and a half years. She has been tired, thin and weary. Occasionally she has pains in the abdomen. This pain seems to follow exertion, but it is rather vague. For six months fullness of the abdomen has been noted. No sickness; no diarrhœa; no hæmorrhage from mouth or nose, or into the skin; no stomatitis. Illnesses: Diphtheria at the age of 1½ years, measles at the age of 3½ years, chicken-pox at the age of 4½ years.

Examination: Dark complexion, nourishment poor, *marked cyanosis* of lips, tongue and throat. Capillaries of cheeks deeply injected; cheeks otherwise dusky. Sclerotics very white. *Fingers clubbed*. Circulatory system: Pulse 90, regular, fair volume. Heart: Apex beat in fourth space inside nipple line. Mitral: First sound booming, second audible; no bruits. (N.B.—In May, 1913, a *pulmonary systolic murmur was audible*. It was doubtful whether this was congenital or *hæmic*.) Respiratory: Nothing abnormal. Alimentary: Tongue furred; tonsils enlarged and infected. Abdomen full. Liver: Sixth rib one and half finger-breadths below costal margin. *Spleen: Three finger-breadths below costal margin*. Nervous: Reflexes equal and natural. No localized wasting. Pupils natural.

¹ *Brit. Med. Journ.*, 1911, ii, p. 16.

36 Poynton: *Three Cases of Alopecia Areata in same Family*

HÆMAPOIETIC SYSTEM.—BLOOD EXAMINATION.

			May 23, 1913	November 8, 1913.
Red blood cells	...	...	6,200,000	6,720,000
White blood cells	....	..	10,100	10,880
Hæmoglobin	...	...	88 per cent.	94 per cent.
Colour index	...	...	0·67	0·7
<i>Differential—</i>				
Polymorphonuclears	...		67 per cent.	77 per cent.
Small lymphocytes	...		10 „	} 16 „
Large lymphocytes	...		10 „	
Large mononuclears	...		5 „	0
Eosinophiles	...	...	—	0
Basophiles	...	...	—	0
Transitionals	...	...	5 per cent.	2 per cent.
<i>Abnormal cells—</i>				
Myelocytes	...	...	None	None
Myeloblasts	...	...	3 per cent.	5 per cent.
Nucleated reds	...	...	None	None
			Reds vary in size ;	Reds vary little
			no polychromatophiles ;	in size
			no poikilocytosis	

November 18, 1913: Wassermann's reaction negative.

The diagnosis lay, in Dr. Poynton's opinion, between congenital morbus cordis and erythræmia—perhaps he inclined to the former.

Three Cases of Alopecia Areata in Children in the same Family.

By F. J. POYNTON, M.D.

Case I.—L. P., male, aged 6 years. Born at full term, and a natural growth of hair developed in infancy. For two years before being seen in March, 1913, had been in a condition of total alopecia. Since treatment there has been great progress.

Case II.—A. P., male, has not been seen, but he also after infancy developed the same condition, and was treated by the mother on her own initiative with the same remedies. There is, she says, considerable improvement.

Case III.—R. P., female, aged 2 years. Alopecia for six months. Since the commencement of treatment there has been some sign of hair growth, but the patient is shown to illustrate the complete nature of the alopecia.

One aunt has complete alopecia.

Treatment: suprarenal extract internally, salicylic and carbolic acids externally.

The interest of these cases lies in the prompt response to treatment, and in the possibility that the internal administration of suprarenal extract might have been a factor. The work of Sabouraud on internal secretions and alopecia was suggestive.

Case of Ununited Fracture of Neck of Femur; Operation after Eight Years; Result.

By H. A. T. FAIRBANK, M.S.

A GIRL, aged 16 years, giving a history of having been knocked down and run over by a van in October, 1904. The diagnosis is said to have been "comminuted fracture of femur near the neck." The left leg had always been short since the accident, which necessitated her lying in bed many weeks. The shortness was said to be increasing. Pain was present at times only, but was getting worse. The pain was severe at night, it waked her; it was particularly noticeable on rising after sitting for long, but was not at other times caused by walking, except in wet weather. On examination, the left leg was found to be generally wasted, and was held in an everted position. Flexion of the hip was only possible to a right angle; abduction was practically abolished; extension and adduction were slightly limited. The trochanter was raised, prominent, and thickened anteriorly. Real shortening, 2 in. A skiagram showed an ununited fracture of the neck of the femur and coxa vara.

The case was shown to the Section in November, 1912.¹

Operation in January, 1913. The fibrous bond of union was excised, the bony surfaces freshened, and two long screws driven from the trochanteric surface through into the head, the leg being extended as much as possible.

In June last a skiagram showed that bony union had occurred, and this is confirmed by a recent skiagram. The leg is still 2 in. shorter than the other, but the progress of the deformity and the accompanying pain have been abolished by the operation. She now walks well.

¹ *Proceedings*, 1913, vi, p. 31.

Case of Osteo-periostitis of Upper End of Femur.

By H. A. T. FAIRBANK, M.S.

A GIRL, aged 5 years, was brought to Dr. Poynton's out-patient department at Great Ormond Street in July last with a history of wasting and pain in the right leg. Nothing definite could be made out at first. On subsequent visits complaint was again made of pain in the leg. This pain occurred particularly when the child got up in the morning. Tenderness in the adductor region was noticed, but no swelling or thickening of the femur. In September a skiagram showed a thickening of the upper part of the shaft and neck of the femur. The thickening now present could then be felt in the region of the lesser trochanter. When asked to point to the site of the pain the child always pointed to the inner part of Scarpa's triangle. The child limped slightly.

She was admitted to hospital for rest and investigation. Beyond the thickening and tenderness at the upper part of the femur nothing could be made out. There were no signs of disease elsewhere. The right hip-joint seemed to be normal. No history of specific disease could be obtained and the Wassermann reaction gave a negative result. Mercury and iodides were given without effect. Temperature never above 99° F. So long as the child is in bed she is free from pain, but as soon as she is allowed to get about again she complains of the pain. Her past history contains the facts that she had "bleeding piles" a few months ago and lost much blood, and that she had pneumonia four years ago. No history of traumatism. The skiagrams suggest an inflammatory lesion, not a new growth.

The case is shown on account of the obscurity of the cause. It is suggested that an operation should be performed with the object of cutting a deep groove in the affected portion of bone.

Two Sisters with Deformity of Bones and Splenomegaly.

By FREDERICK LANGMEAD, M.D.

Case I.—L. S., aged 6 years 5 months. History: The child began to crawl at the age of 5 months, according to the mother, and then the legs were noticed to be crooked. She did not attempt to walk until over 2 years old, and could not walk alone until aged 4 years. She was entirely breast-fed for six months. From 6 months to 9 months she was fed on milk, lime water, barley water, and raw meat juice, and was taking a quart of milk daily. There has been no acute illness. The mother suffers from anæmia, the father is "delicate." A brother died of malnutrition when aged 3 years. The skeletal changes closely resemble those of rickets. The skull is bossed, the ribs are everted and beaded, the epiphyses enlarged, especially at the wrists and ankles. The femora are incurved; the tibiæ are prominently bowed forward and inward, the concavity being outwards. Genu valgum is very marked. The shins are very prominent and of "ploughshare" form, the anterior borders of the tibiæ being sharp and sinuous. The muscles are everywhere flabby, those of the legs being especially poorly developed. The spleen extends downwards as far as the anterior superior spine of the ilium and fills the left side of the abdomen. The liver reaches downwards for about an inch below the costal margin. Blood examination (Dr. Nabarro): Red blood corpuscles, 3,960,000 (79·2 per cent.); white blood corpuscles, 12,400; hæmoglobin, 56 per cent.; colour index, 0·7. Differential count: Polymorphonuclear cells, 66 per cent.; small lymphocytes, 9 per cent.; large lymphocytes, 17·5 per cent.; large mononuclear cells, 2 per cent.; eosinophiles, 1·5 per cent.; basophiles, 0; transitional cells, 1 per cent.; myelocytes, 0; myeloblasts, 3 per 100 leucocytes; nucleated red cells, 3 per 200 leucocytes. The red cells vary much in size and in staining properties. There is some granular degeneration of the red cells. The Wassermann reaction is negative.

Case II.—B. S., aged 5 years 4 months. The mother gives an almost precisely similar history as in the case of the elder sister. The bony changes closely resemble those in the first case, but have developed to a less degree. The spleen is also enlarged, but less so, reaching about an inch below the costal margin. The liver is palpable. Blood examination (Dr. Nabarro): Red blood corpuscles, 4,610,000 (92 per

cent.) ; white blood corpuscles, 16,600 ; hæmoglobin, 70 per cent. ; colour index, 0·76. Differential count : Polymorphonuclear cells, 60 per cent. ; small lymphocytes, 18 per cent. ; large lymphocytes, 13 per cent. ; large mononuclear cells, 2 per cent. ; eosinophiles, 4 per cent. ; transitional cells, 2 per cent. ; myelocytes, 1 per cent. ; nucleated red cells, 2 per 100 leucocytes. The red cells vary much in size. The Wassermann reaction is negative.

The points of interest in the cases are :—

(1) The diagnosis : the skeletal changes are such as occur in rickets, but they appear to be progressive, for the younger child shows less marked changes of a precisely similar form—such, according to the mother, as the elder child showed at the same age.

(2) The splenomegaly : marked in the more deformed child, less so in the younger one. Rickets alone is not generally acknowledged to cause splenic enlargement. Even if rickets be held to be the cause, why is the enlargement progressive, seeing that the usual period for active rickets is over ?

Skiagrams are shown of both cases. The epiphyses appear to be characteristic of rickets. The thickening of the compact bone at the bends and the irregularity of the outline of the medullary canals of the long bones is perhaps unusual. Apart from the splenomegaly the cases appear to correspond to those of a form of dwarfism described by Hutinel, Tixier, and Roederer.¹

[*Note.*—After the children were exhibited an opportunity occurred of examining the father. He was jaundiced, and said that he had been subject to attacks of jaundice since early youth, but had not been ill enough to consult a medical man for nine years. Examination of the abdomen disclosed the fact that his spleen was very large, reaching to the iliac crest. He stated that his mother (the grandmother of the children) had suffered also from a large spleen, for which she had been treated for many years.]

Dr. H. D. ROLLESTON said that, while it was generally agreed that rickets did not cause enlargement of the spleen, yet splenomegaly of varying degrees was found in a certain proportion of the cases of rickets, and was, he believed, intestinal in origin. Intestinal disturbance was an important feature in rickets, and possibly some unusual infection, superadded to the intestinal conditions commonly present in rickets, was responsible for the considerable splenomegaly present in the cases shown by Dr. Langmead. It would therefore be interesting to hear if the urine presented any evidence of abnormal intestinal metabolism.

¹ *La Presse méd.*, Par., 1913, xxi, p. 95.

Section for the Study of Disease in Children.

December 12, 1913.

Dr. LEONARD G. GUTHRIE, President of the Section, in the Chair.

Discussion on Enlargement of the Spleen in Children.

Opened by ROBERT HUTCHISON, M.D., and
Sir JOHN BLAND-SUTTON, F.R.C.S.

DR. ROBERT HUTCHISON: I would suggest the following grouping of the chief conditions in which enlargement of the spleen is met with in children in this country:—

- (1) *Tumours*.—Neoplasms, endothelioma (Gaucher), cysts, &c.
- (2) *Infective*.—E.g., typhoid, ulcerative endocarditis, malaria, tuberculosis, lymphadenoma, chronic arthritis (Still).
- (3) *Chronic Venous Congestion*.
- (4) *Metabolic Disorders*.—Rickets, lardaceous disease.
- (5) *Blood Diseases*.—Leukæmias, pseudo-leukæmia (splenic anæmia of infancy), chloroma, congenital anæmia with splenomegaly and jaundice.
- (6) *Splenic Anæmia of Adult Type*.
- (7) *Syphilitic*.—(a) In infancy; (b) in later childhood.
- (8) *Splenomegaly with Acholuric Jaundice*.
- (9) *Splenomegaly with Cirrhosis of Liver*.—(a) Portal cirrhosis, alcoholic and other forms; (b) biliary cirrhosis (Hanot type); (c) syphilitic cirrhosis; (d) Banti's disease; (e) congenital obliteration of bile-ducts.

It will be noticed that the classification adopted is mainly a clinical one, without any pretence of being strictly logical, and that there is some overlapping between the different groups, but it will serve as well as any other as a basis for discussion.

I may be allowed a few brief remarks explanatory of each group.

(1) *Tumours*.—These include cysts, neoplasms, and the Gaucher type of familial splenomegaly (endothelioma). They are very rare in childhood and do not require further consideration.

(2) *Infective Enlargement* is met with in many general infections, such as typhoid fever, malaria, ulcerative endocarditis, tuberculosis, lymphadenoma, and so-called rheumatoid arthritis in childhood (Still's disease). These enlargements differ in no way from the enlargement met with in the adult in the same conditions.

(3) *Chronic Venous Congestion*, the result of cardiac or pulmonary disease, may cause a slight and unimportant degree of splenomegaly.

(4) *Metabolic Disorders*.—Chief of these are rickets and lardaceous disease. Enlargement of the spleen from uncomplicated rickets is never great and the possibility of a pushing down of the organ by a falling in of the chest must always be allowed for. Splenomegaly from waxy disease is now but rarely met with except in association with syphilis.

(5) *Blood Diseases*.—Chronic myeloid leukæmia, which causes so great a degree of enlargement of the spleen in adults, is a rare disease in childhood, but the acute myeloid and lymphatic forms of leukæmia are not very uncommon and are attended by a considerable degree of splenomegaly. Closely allied to these is the enlargement met with in chloroma. By far the commonest blood disorder in early childhood, however, which is characterized by marked enlargement of the spleen is the so-called pseudo-leukæmia of von Jaksch (splenic anæmia of infancy). Mention must also be made of those rare cases of congenital anæmia with jaundice and splenomegaly described by Buchan and Comrie,¹ of which I have also met with one example. The pathological problems which arise in connexion with enlargement of the spleen in diseases of the blood in children do not differ from the kindred problems which arise in the case of adults, and hardly fall within the scope of this discussion.

(6) *Splenic Anæmia of the Adult Type*.—There is no doubt that cases are sometimes met with in later childhood which are indistinguish-

¹ *Journ. of Path. and Bact.*, Camb., 1909, xiii, p. 398.

able from the splenic anæmia of adults. I have described a series of such cases elsewhere.¹ They are characterized by great enlargement of the spleen with a slight degree of anæmia persisting for a variable number of years, after which cirrhosis of the liver supervenes with ascites and gastro-intestinal hæmorrhages (Banti's syndrome). I shall have something to say about the pathology of these cases later on.

(7) *Syphilitic Enlargement*.—One can distinguish here between the slight degree of enlargement of the spleen, which is so often met with in syphilitic infants, and the more marked splenomegaly which is one of the later manifestations of the disease after the second dentition. The latter variety is usually (? always) associated with cirrhosis of the liver.

(8) *Splenomegaly with Acholuric Jaundice*.—The familial form of this disease is met with in childhood, but it has been the subject of so much discussion of late that there is no need to refer to it in detail.

(9) *Splenomegaly with Cirrhosis of the Liver*.—The association of enlargement of the spleen with cirrhosis of the liver is not infrequent, and raises some interesting problems. Several varieties may be distinguished: (a) The cirrhosis may be of the multilobular or "hobnail" type; some of these are alcoholic in origin, but there is reason to believe that other poisons may produce a similar result. (b) The cirrhosis may be of the monolobular or biliary variety (the hypertrophic cirrhosis of Hanot); in some of these the enlargement of the spleen is relatively much more pronounced than that of the liver and precedes the latter in time (the metasplenomegalic form of biliary cirrhosis of French writers). (c) The cirrhosis may be of syphilitic origin and have the characters associated with that variety. These cases have already been referred to. (d) Enlargement of the spleen may exist for years and be followed by a multilobular cirrhosis. These cases fall within the definition of Banti's disease and have been referred to under (6). (e) The cirrhosis may be consequent upon congenital obliteration or malformation of the bile-ducts.

This discussion will concern itself, I take it, chiefly with the last four groups of splenomegaly mentioned in the above scheme. Two sets of problems arise—(i) Pathological, (ii) Therapeutic.

(i) As regards pathology, we have to ask ourselves (a) What is the cause of the enlargement of the spleen? and (b) what is its relation to the pathology of the disease as a whole? and, especially, is the spleen

¹ *Brit. Med. Journ.*, 1908, ii, p. 1156.

playing an active or passive part in the production of the latter? As regards the first of these questions, it is reasonably certain that the cause of the enlargement is not the same in all the groups, but we have particularly to inquire what part is played by syphilis in its production. Hitherto it has been generally supposed that an enlargement of the spleen in childhood without obvious cause is presumptive evidence of syphilis. The results now yielded by the Wassermann reaction should enable us to test the validity of this assumption. I would suggest that in groups (6) and (8) syphilis plays no part, and in the cases associated with cirrhosis, also, I think there is no reason to suppose that there is a syphilitic infection except in those in which the cirrhosis of the liver is of the well-known syphilitic variety. As to the ultimate cause of the splenomegaly met with in acholuric jaundice, in splenic anæmia of the adult type, in portal and biliary cirrhosis and in congenital obliteration of the bile-ducts, I have no suggestion to offer.

The results of splenectomy are now enabling us to tell whether the part played by the enlarged spleen is an active or passive one. So far it seems clear that in groups (6) and (8) the spleen is in some way the cause of the other features in the clinical picture, although how it is so is still a matter for speculation. To what extent the spleen is responsible for inducing cirrhosis of the liver other than the cirrhosis of Banti's disease is still undetermined.

(ii) As regards therapeutics, discussion must centre chiefly upon the question as to which varieties of splenomegaly are suitable for operation. Experience so far indicates that splenectomy is curative in cases of splenic anæmia of the adult type—group (6)—and in cases of acholuric jaundice, though the comparatively benign course of the latter renders it questionable whether operation is justified unless in exceptional circumstances. It is also, of course, the only available plan in the cases which fall under group (1), whilst it will be generally admitted that it is entirely inadmissible in the splenomegaly of blood diseases—group (5).

The surgeons will, no doubt, have something to say about the technique of the operation.

SIR JOHN BLAND-SUTTON: A curious fascination surrounds the surgery of the spleen. The fact that the human body contains an organ so conspicuous as the spleen, for which no definite function can

be assigned, is calculated to excite curiosity. It is a tradition among persons usually callous to the facts of physiology that the spleen can be removed without obviously disturbing the physiologic processes of the body. The rapid increase in the size of the spleen after birth and the facility with which it becomes engorged in fevers and other infantile diseases, especially rickets, is well known. Its activity during infant life suggests that it has important functions in the dawn of life, probably none at the decline, for after the fortieth year the spleen diminishes in size, and in old age is, as a rule, shrunken and insignificant. Although a spleen is often misshapen and sometimes misplaced at birth, I have never known it congenitally absent and know of no observation of such an anomaly. The architecture of the spleen, as studied with the aid of a microscope, assisted by all the best methods of histology and histologic chemistry, throws no light on its functions. The real dawn of knowledge in regard to its uses began with the physiologic and pathologic studies of the cytology of the blood; then the twilight began to disperse, and observations made during the last ten years have shed a clearer light on the matter and a working hypothesis is available for the surgeon.

The enlarged spleen associated with numerical reduction of the red corpuscles in the disease of children known as splenic anæmia is due to functional over-activity of the spleen. The enlargement of the spleen is due to the accumulation of the products of hæmolysis: in plain terms, it is like a fire encumbered with its ashes, for the spleen is an organ where the red corpuscles are destroyed, and when its destructive activity is excessive, harmful products, the result of this over-action, accumulate in the blood, producing, in addition to anæmia, acholuric jaundice. Physicians who have specially studied splenic anæmia are unanimous that it often ends fatally, and there can be little doubt that some wandering spleens in young women are chronic examples of this disease, the mobility of the organ being caused by its abnormal size. To put it plainly: giant spleens and wandering spleens in adolescents are the result of changes which begin in the spleen during infancy and slowly progress with the growth and development of the patient. In a case reported by Box there was evidence of the existence of an enlarged spleen from infancy. The girl, aged 12 years, unfortunately died after splenectomy with suppuration in the pedicle. I splenectomized a young woman, aged 22 years, under the care of my colleague Dr. Essex Wynter, for acholuric jaundice. After removal of the spleen

the yellowness of the skin which had been conspicuous since birth immediately disappeared.

When it was suggested to me that I should discuss the surgical aspect of splenic enlargements in children I accepted the task willingly, for I was keen to make an attempt to collect the floating knowledge regarding the remote effects of splenectomy in children. My facts are few, but they show without doubt that the spleen can be removed from children without interfering with their growth and development. The spleen has been removed from children suffering from splenic anæmia with sufficient frequency to establish the operation as a life-saving measure. I believe that satisfactory evidence is available to prove that the good consequences are not only immediate, but permanent. In 1895 I excised the spleen from a girl, aged 5 years; this is probably the youngest child submitted to splenectomy for splenic anæmia, but Millward removed the spleen successfully from a boy, aged $1\frac{1}{2}$ years, who had been run over by a cart. Sutherland and Burghard's patients were girls, aged 6 and 12 years respectively. Hutchinson removed the spleen from a boy, aged 7 years. Makins removed the spleen from a girl, aged 9 years; and a girl, under my care with splenic anæmia and jaundice, was aged 17 years when I removed an enormous spleen. Though this group is small it is instructive, for the subsequent history of the patients is available. The girl from whom Makins removed the spleen was in good health three years later. Sutherland and Burghard reported the two girls in good health, one four and the other seven years after operation. The girl aged 17 years from whom I removed the spleen was in robust health ten years afterwards. The girl aged 5 years whom I splenectomized in 1895 is now aged 23 and works as a compositor in her father's printing shop. She is described as a healthy, attractive and handsome woman.

Points in technique, perhaps, are not wanted in this discussion. The removal of the spleen is a straightforward proceeding. I open the abdomen by an incision in the left linea semilunaris and gently withdraw the spleen. It is held by the suspensory (phreno-colic) ligament attached to its upper pole; it should be snipped with scissors; the spleen then slips out quite easily. Rarely, a big spleen in a small child is not easily withdrawn, then the surgeon may incise the abdominal walls at right angles to the primary incision more or less parallel with the left costal arch. The vessels are secured with hæmostatic forceps and divided with the gastrosplenic omentum close to the spleen. After the

organ has been excised the vessels are tied with silk. With a big spleen a dozen ligatures may be required. Too much care cannot be expended in securing the vessels. The greatest danger of splenectomy lies in the slipping of badly applied ligatures after the patient has been returned to bed. The abdominal incision is closed according to the fancy of the surgeon. The after-treatment is conducted on the lines common for abdominal operations in general and recovery is, as a rule, remarkably quick and uneventful.

The disentanglement of the various kinds of enlarged spleens has been effected by a study of the microscopic features of the blood and reflects the highest credit on the physicians who have accomplished it, for the giant spleens formed a conglomerate group inseparable by mere histological methods. The jaundice so often associated with splenomegaly in children and adolescents is a matter of interest. In my early cases of splenectomy, especially in a patient with a wandering spleen and yellowness of the skin, I attributed the jaundice to kinking of the duodenum by a heavy spleen dragging on the stomach. The kink was in my own mind, I was intellectually blind and did not recognize, until I became acquainted with the admirable papers of Parkes Weber on "Acholuric Jaundice," that when jaundice is associated with splenomegaly and anæmia the urine is bile-free. The jaundice depends on harmful products, arising from the excessive destruction of red corpuscles in the spleen, circulating in the blood. The important fact established by observations of the blood is this: When the spleen is removed from children suffering from splenic anæmia the symptoms disappear permanently. I think the most extraordinary feature connected with splenectomy is the rapidity with which the normal numerical proportion of the red corpuscles is re-established; sometimes in a few weeks. In a typical case of splenic anæmia the red corpuscles are usually $2\frac{1}{2}$ million per cubic millimetre. Three months after the patient has been deprived of the spleen the red corpuscles will number 5 million per cubic millimetre, and the improvement of the patient's health is most satisfactory. To-day any abdominal swelling resembling an enlarged spleen suggests a blood count, and he is an unwise surgeon who removes a spleen before making a microscopic examination of the blood. The removal of a leukæmic spleen always ends in disaster. In dealing with splenomegaly the physician is the reliable guide and the surgeon his willing instrument.

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Dr. G. A. SUTHERLAND: For a long time the chief interest of splenic enlargement was its diagnostic value in various affections. The spleen was known to become enlarged in connexion with certain local or constitutional diseases, but was not regarded as the primary seat of disease. In his work on "Pediatrics," published in 1906, Dr. Rotch, of Boston, says, "there are no primary diseases of the spleen." If this were so, then an enlargement of that organ cannot be regarded as a possible indication for treatment directed to it. If the term "primary" be emphasized, we may have a difficulty in disproving his statement when interpreted literally but not clinically. In a literal sense it may be said that there are no primary diseases of the appendix, and that all are secondary to some form of infection. In a clinical sense, however, we speak of appendicitis as a primary disease of the appendix, and justify this by the fact that all symptoms of the disease disappear when the appendix has been removed. In the same way, if we find that an enlargement of the spleen is accompanied by certain definite signs of disease, and, if by excision of the spleen these signs are made to disappear and the patient is restored to health, then I take it we are entitled to speak of this condition as a primary disease of the spleen. At the present time, instead of there being no recognized primary diseases of the spleen it would appear that the number of them is increasing, as judged by the results of splenectomy for the relief or cure of various clinical phenomena. Here, as in other cases, surgical procedures have gone ahead of pathological knowledge, for it is not yet known what the exact nature of the splenic disease has been. This ignorance has naturally hampered the physician in his attempt to find remedial measures. Whatever the disease, it has been clearly established that removal of the spleen means the relief of all symptoms and the cure of the patient.

My own interest in enlargement of the spleen in childhood has

centred chiefly in the condition of "splenic anaemia" or "primary splenomegaly," as it occurs after the age of infancy. The type of disease is the same as that met with in adult life. The clinical phenomena are sufficiently definite to make the disease easily recognizable after the first stages have passed. The first point I have to note is that in my two cases the splenic anaemia was a family affection. A sister of one patient had died at the age of 13 years from splenic anaemia. An uncle of the other patient had suffered for years from splenic anaemia. These facts suggest that in some cases at least there is a defect somewhere in the developmental processes in certain members of these families, which shows itself more especially in connexion with the splenic area.

In both of my cases the progress of the patients was steadily downhill. There was an increasing degree of anaemia, lethargy and debility. It became clear that in all probability the patients would die if the condition were not relieved. But this is by no means always the case. We may find in the same family members who have grown up to adult life with a condition of splenic anaemia, varying from time to time in the intensity of the symptoms, while others have died young of progressive disease. Some writers lay stress on the prolonged course of the disease, others emphasize the fact that death usually occurs in from six months to four years from the onset of symptoms. This fact points to the conclusion that the severity of the disease depends on the extent and character of the disturbance of splenic function which is present.

Opinions differ as to the nature of the disease or disturbance in the spleen which produces the symptoms of splenic anaemia. Some hold that the spleen is destroying the blood cells by means of some toxin. Others believe that there is an inhibition of blood formation in the spleen. My own experience of splenectomy in such cases points strongly to there being an excessive destruction of blood cells going on in the spleen, and consequent anaemia. In one case, three days after operation the red cells had increased by 2,200,000, and the haemoglobin by 36 per cent. In the other case, four days after operation the red cells had increased by 2,200,000, and the haemoglobin by 22 per cent. At the same time the general appearance of the patients was greatly improved, and the other symptoms of the disease were vanishing rapidly. It is difficult to believe that such rapid improvement could have taken place if there was any chronic infection in the system or in

the spleen, or if the spleen had been inhibiting blood formation. It appears to me that the above facts are most easily explained by the assumption that the spleen had been over-active in the destruction of blood cells, while the blood-forming organs had been working at high pressure in order to counteract the loss of cells. Probably it is only in early life when the blood-forming organs are so active that these sudden and striking results will be obtained.

If there is a process of blood destruction going on, what brings this about? Pathological investigators are agreed as to a general hyperplasia of the splenic tissues, but have not been able to determine any other definite change. When one examines the spleen after splenectomy in these cases one striking feature is the amount of blood contained in the organ. When the divided blood-vessels of the pedicle are freed the blood rushes out, and on squeezing the organ it is found to collapse like a sponge, the great size having been due to the contained blood. The splenic vessels are large, and this has usually been ascribed to the call of the spleen for more blood. On the other hand, it is possible that there may be primarily a pathological condition of the splenic vessels, a vasomotor disorder, leading to hyperæmia of the spleen. We find in this affection that there is a marked tendency to gastric hæmorrhage, often at a comparatively early stage, and quite out of proportion to the frequency of hæmorrhages in other parts. This gastric hæmorrhage is usually ascribed to mechanical displacement of vessels, but it is not found in other forms of splenic enlargement with anything like the same frequency. On the other hand, if the size of the splenic artery is pathologically increased the branch to the stomach wall will also probably be similarly affected, and a tendency to gastric hæmorrhage will naturally follow. Even after the removal of the spleen for splenic anæmia gastric hæmorrhage may supervene at a considerable interval of time, as published cases have shown.

An excessive blood supply to an organ may disturb its natural functions. We see this in the case of the thyroid gland in Graves's disease. The natural functions may be stimulated to excess, or they may become perverted. The destruction of red blood cells is usually regarded as one of the functions of the spleen. If this function be stimulated to excess by a superabundant blood supply, the result may be that the balance in the body between blood formation and blood destruction is seriously disturbed, and that the latter predominates. The spleen may be said to be inebriated with the exuberance of its own

blood supply. If we assume that there is not necessarily any disease in the spleen in this affection, but only a disturbance in certain of its functions from hyperæmia, we shall be able to understand the varying conditions present in family cases. The congenital defect may be referred to the vascular supply of the spleen, and, according to the degree of that defect, we may find some cases with no symptoms, others with only mild symptoms, and others with progressive symptoms leading to death from excessive blood destruction.

The question of the ultimate result of splenectomy for splenic anæmia is a very important one. In the two cases of splenic anæmia under my care, on whom Mr. Burghard performed the operation of splenectomy, the result has been a complete cure; in the one case seven years have elapsed since the operation, and the patient is now aged 20 years; in the other three years have elapsed, and the patient is now aged 9 years. There has been no recurrence of the symptoms, no evidence of any injury from absence of the spleen, and the blood counts have continued normal in all respects. I cannot recall in my experience of surgical proceedings any results which have been so striking and so permanently beneficial as those from splenectomy in splenic anæmia.

Dr. POYNTON said that he realized the importance and difficulty of the subject under discussion, and the widespread desire there must be among many of the Fellows to add their part to the discussion. He would accordingly limit his remarks to the group of cases included under *family acholuric jaundice*. He had four families under observation, including twelve individuals, and among them were some of the earliest examples shown in this country, and consequently cases which had been under observation for some years. With but little exception his remarks would deal with clinical points. In passing, he would remark that in three of the four families Wassermann's test had been undertaken, and in each instance had been negative; the fourth group had not been investigated. In all the families the hereditary tendency was apparent, and amongst them the similarity in the appearances of a father and son and a father and daughter were most striking. He believed that he was among the first to point out in this country that the condition of yellowness might alternate with that of anæmia, and that an enlarged spleen with an anæmia so little tinged with a yellow colour as to be easily overlooked might occur in some members of these

families, a statement recently supported by Dr. Parkes Weber. This was an important point, because it left us in considerable doubt as to their interpretation when we met with isolated examples of the anæmic type. There seemed to him no particular rule as to which child in a family would be the most affected, it might be the eldest or the middle one, or, again, the youngest. Unfortunately, the only newborn child in these families died of jaundice in the first fortnight of life before he had any chance of learning of its arrival.

He thought that he probably expressed the feelings of other Fellows when he confessed to the suspicion that he had sometimes felt that the symptom-complex was not a clear one, and possibly included different processes; nevertheless, his experience of the malady had led him to the conclusion that the same underlying fault, whatever it might be, might show itself under different clinical aspects. He recognized very clearly those cases which were always more or less yellow, somewhat anæmic with enlarged spleens, and slightly enlarged livers, and were liable to attacks in which they became much more yellow. On the other hand, he had seen a case in the same family as one of these, admitted to hospital intensely jaundiced, and a year later admitted again as a severe "chlorosis." Again, he had seen a case of the anæmic type develop during an exacerbation of symptoms the tinge of yellowness which was so peculiar. There was another type he had seen with fainting attacks, lassitude, pigmentation, and low blood-pressure, which simulated closely Addison's disease. So close was the likeness, that at a meeting of the Association of Physicians in London several distinguished clinicians had been convinced that one case he had shown was of that nature. With his knowledge of the family, he was himself not inclined to accept the diagnosis, and had made a point of tracing the girl, and two years later there had been great improvement, and no one could have suggested the diagnosis of Addison's disease. At that time the girl had an enlarged spleen as before, with some pallor, but no pigmentation or jaundice and no fainting attacks. Dr. Guthrie had previously had a similar case.

The fragility of the red blood corpuscles *in vitro* had been very carefully investigated, in his cases by Dr. Embleton, Dr. Thursfield, and Dr. Lukis, and cautious though he was in relying upon tests of this nature, he could only state that almost invariably there was an increase in fragility as compared with controls. Most interesting to him were the red cells which showed granules in their protoplasm when treated

by the method of "vital staining." An example, the first he believed shown in this Section, was demonstrated for him by Dr. Lukis this year. Attracted by the Continental writings upon this subject, he had suggested this investigation to Dr. Lukis, and he was able to say that some very interesting and suggestive researches had been made by that gentleman, which would no doubt be shortly published. He himself felt he had no right to say more than this, that these red cells were a revelation to him, and seemed to open up a new line of investigation in the problems of hæmatology.

These children, when attacked by an acute infection, might show high, irregular and prolonged fever, and a very remarkable and rapid anæmia might follow. In one of his cases the red cell count fell to 1,500,000 per cubic centimetre, and he believed he was correct in saying that the President (Dr. Guthrie) had recorded an even more striking case. Although bile was usually absent from the urine it was known that this was not invariable, and his experience supported the occasional occurrence of bile pigments and also some pallor of the motions. Abdominal pain was known to be very frequent, and his experience was that this symptom was more liable to appear with advance in age. It had been more severe in his yellow cases than in the pale ones. This was the symptom that took the pleasure out of the lives of the patients, and was the one which made him think particularly of operative measures, although prolonged anæmia with its chronic ill-health was also another important element in that question.

He thought it right for him to say that he had not yet had a case operated upon, although in one case, that of a young woman, he had recently advised it. With this exception none of his younger patients were, he thought, in the present stage of our knowledge, really ill enough to advise such a step. The slighter cases certainly improved in some instances, and he had thought that two of them had grown out of the weakness, but he was obliged to admit that one of these had still a palpable spleen, and had not been so well again of late. We must, he thought, realize how well some of these patients got through their life-work in spite of this weakness. Cold was apparently one of the chief enemies of these patients, with one solitary exception, in which great heat was always accompanied by increased malaise. All his patients had shown this peculiarity, that in cold weather all their symptoms were likely to increase. He differed from some observers in his belief that arsenic was a useful remedy for those cases with marked pallor.

The diagnosis was full of difficulties and they were very interesting ones. They were mainly dependent upon the particular clinical feature which predominated. Diagnoses of gall-stone colic (we knew gall-stones might occur), gastric ulcer, intussusception, and renal colic had been among those made in his cases. Syphilis of the liver, splenic anæmia, chlorosis, and Addison's disease were other diagnoses that had been made in his comparatively small collection. He was convinced that the condition was one that deserved very full and extensive investigation in the future from that point of view. He had no fatal case to record.

He would conclude by contrasting with this group a very remarkable case he had observed. This was a young lady with congenital heart disease, congenital absence of one arm, a congenital persistent and exacerbating jaundice, reaching an extreme degree, a large liver, an enormous spleen, bouts of fever, chronic ulceration above either ankle, slow to heal, and a urine loaded during the exacerbations of jaundice with bile, and motions which were absolutely colourless. This condition suggested some congenital defect in the biliary apparatus rather than some congenital fault of the blood-forming apparatus.

Dr. THURSFIELD said he had listened with the greatest interest to Sir John Bland-Sutton's remarks, because he felt that physicians scarcely deserved the compliment which he paid them. Sir John seemed to think that physicians had, by examination of the blood, solved the problems associated with the diagnosis of spleen conditions. He (the speaker), on the contrary, after some experience of blood examinations in these cases, had come to the conclusion that until they could invent such new methods as Dr. Lukis would probably refer to, the matter was not much more advanced now than ten years ago. The type of disease which was called, variously, splenic anæmia or splenomegaly one must admit to be a congeries of cases due to different causes. From that group there had been separated off the group of acholuric jaundice. But even that was not yet a homogenous group. The cases mentioned by Dr. Poynton had been of the family type. There also were undoubtedly acquired cases, both in children and in adults, which behaved—so far as the tests applicable enabled one to judge—in precisely the same way as those of the family group. But the causation remained obscure, though it was certainly not syphilis. Splenic anæmia, so-called, Dr. Hutchison had already split into five divisions, which, as

clinical divisions, were convenient and useful. But with regard to the pathology of the various cirrhoses, he did not think any advance had been made. He did not expect help in that respect from morbid anatomy. Dr. Sutherland referred to the fact that in his cases of splenic anæmia, in which Sir John Bland-Sutton removed the spleen, the spleen after removal was found to be a mere sponge of blood, blood dripping from it in large quantity when it was taken away. He had seen that condition in cases which had been labelled splenic anæmia, and had also seen a spleen removed from which he could not get more than an ounce of blood; the spleen was almost solid with fibrosis. Even when it had been cut into small pieces and passed through a sausage machine very little blood could be extracted. In a case of acholuric jaundice—not of the family type—under his care last year, that of a boy, aged 10 years, his colleague Mr. Gray removed the spleen, which weighed 45 oz. Yet by subjecting it to such pressure as was possible by manipulation not more than 3 or 4 oz. of blood could be got from it—there was so much firm fibrous tissue. He was thus led to say that there was need for new methods of examining cases of splenic anæmia, and especially of some method which would enable one to test for the presence of hæmolysins in the blood of the patient, and to recognize the point of origin of those hæmolysins. At present there was no method by which one could examine the blood of the living patient, or tissue removed from him, and demonstrate the hæmolysins causing the anæmia or the pigmentation, as the case might be. Still, he did not despair of the possibility of some such method being found, because the examination of hæmolysins had made enormous strides in recent years, and good work was being continued. With such a method he believed there would be available a guide as to which spleens could with safety be removed, and which, in a case of urgency, ought to be removed. He believed a good many spleens had been removed without any material benefit; and at present he did not know how those cases were to be distinguished from others. He had not seen splenectomy successful in the cases of so-called splenic anæmia of infants (von Jaksch's anæmia). He could not accept Sir John Bland-Sutton's suggestion that possessors of such spleens in infancy went on to have enlarged spleens in adolescence and adult age. He had followed a number of such cases, and found that their spleen was reduced to quite impalpable dimensions during the ten or twelve years he kept them under observation.

He would like to say a word on the method of examining the blood

which Dr. Poynton mentioned—namely, the fragility of corpuscles. An enormous amount had been written on this question. The study of the behaviour of corpuscles under certain recognized conditions was very valuable in the study of hæmolysins; but from the clinical standpoint, with one exception—their behaviour in various strengths of saline solution—he did not think there was much to be made out of the method. He had examined about one hundred cases of all kinds of diseases, and Dr. Dudgeon and his pupils had examined a larger number. And, with one exception, they had found there was no abnormal fragility of corpuscles in any disease, even including those where one would expect it—namely, purpura hæmorrhagica and scurvy. The exception was acholuric jaundice, and in this disease, with one exception, in twelve cases examined the fragility was abnormal. The patient who constituted the exception was not a child, but was nevertheless worth mention. It was a curious example of enlargement of the spleen with acholuric jaundice occurring in a man, none of whose relatives were affected, who suffered from recurrent attacks of jaundice, during which attacks he was always in better health and strength than at other times. As a matter of fact, he enjoyed his attacks of jaundice. Though he had an attack at the time of examination there was no abnormal fragility of the corpuscles.

He feared that what he had been saying might be regarded as somewhat nihilistic and despairing with regard to diagnosis. He confessed that the more he saw of these cases of enlargement of the spleen, for which one could not assign the cause, the more he felt a wanderer in the dark. Hence he felt that when the patient was not making satisfactory progress the surgeon should be asked to remove the spleen, more particularly because he believed it was perfectly clear that in the vast majority of cases of splenectomy no surgeon had as yet removed the whole of the splenic tissue in the body.

Mr. PHILIP TURNER said he was, as a surgeon, particularly interested in Dr. Hutchison's opening remarks, especially as to the indications for splenectomy. He agreed with the indications which the opener gave—i.e., group 1, group 6, and group 9. He would add another occasional indication for splenectomy—namely, in the condition variously known as pseudo-leukæmia, splenic anæmia of infancy, or von Jaksch's disease, where other treatment had failed. His

experience in operating in such a condition was limited to one case; he thought, however, it warranted a few particulars. He had been interested to see Sir John Bland-Sutton write up the list of ages, because the boy he referred to was aged 5 years on admission to hospital; he was not aged 6 years when operated upon. He was admitted for bronchitis, anæmia, and wasting. The most striking indication of his condition was shown by his previous history, for he had been admitted six times to various hospitals, and once was treated as an in-patient for nine months. It was clear that he was an invalid, and his condition was certainly very serious. He was very wasted, the skin had a yellow, waxy appearance, and his abdomen was enormous, chiefly on account of a spleen which extended into the left iliac fossa. The anæmia was very intense, the reds being $1\frac{1}{2}$ million, the hæmoglobin 25 per cent., the total leucocytes were slightly increased, and the lymphocytes were 50 per cent. of normal. The patient was admitted into the medical ward of Dr. Pitt and then of Dr. French, who made the diagnosis of splenic anæmia of infancy. The child had been in hospital four months, and various forms of treatment were tried, including mercury, iodides and iron, and arsenic. Wassermann's reaction was positive, and salvarsan was injected. He also had X-ray treatment. But, in spite of all, he was worse at the end of the four months than when he entered the hospital. As it was obvious that the child was not improving, removal of the spleen was decided on, after consultation with Dr. French, and that was done in September, 1912. Only slight shock ensued, rapid recovery took place, and the result was very remarkable. Within three months he was practically well and attending school, and the anæmia had disappeared, and in spite of having been wasted, he had good strong limbs, a chubby face, and an excellent colour. Six months after the operation no one would have recognized him as the same child. The child had since been seen by Dr. French, and his condition was in every way satisfactory. The technique of his operation was much the same as that mentioned by Sir John Bland-Sutton; he made a long incision in the left semilunar line, and the spleen was readily brought out through the wound; the arteries were secured in the way described. There was practically no blood lost at the operation, and the shock was surprisingly slight. He was sorry he had not notes of any definite blood counts at the end.

Dr. T. S. LUKIS wished to relate the case of a child which brought to his mind some interesting questions as to the relationship between enlargements of the spleen and acholuric jaundice; the case of a boy, aged 8 years, who was brought before the Medical Society of London last year. The history given by the mother, a very intelligent woman, was that before the child was a year old she noticed a lump on the left side of the abdomen, which had been always there, but was getting larger. There was no jaundice at that time. At the age of 6 years he developed severe jaundice; the motions were white, and the urine a reddish-yellow hue; there seemed to have been definite obstructive jaundice. Jaundice continued from that time, with periodic exacerbations, and when seen by the speaker he presented all the characteristics of acholuric jaundice—marked fragility of cells, an icteric tinge in the conjunctivæ, complexion lemon-yellow, though the stools were of normal colour. He wondered whether in a child with a splenic diathesis it was possible for obstructive jaundice to determine the onset of acholuric jaundice. Mention had been made of the vital staining granules, which he had been studying for some time, and he would bring a few of the results forward in the case of children and some adults, though he could not yet say what was the significance of the vital staining granules. His researches were not yet complete, and his conclusions had not been formed. Still, it seemed clear that, whatever these granules were, they bore a definite relation to blood destruction, and particularly to blood regeneration. One found them in cases which had surgical hæmorrhages; they appeared in the blood for a time during regeneration, and disappeared when the blood condition returned to normal. Usually they were present in very small numbers in normal individuals. The following clinical findings seemed to be suggestive. He had examined seven cases of acholuric jaundice, from four families, and in each case he found a very high percentage of these vital staining cells, as one might expect from reading the work which had been done in France. He also found increased fragility in all these cases, and the highest fragility in the cases most deeply jaundiced, which also were the ones least ill. One case showed 60 per cent. of total red cells abnormal in this way. That was the case mentioned by Dr. Thursfield, whose spleen was removed. A few days after removal the vital staining granules returned to normal. He had seen four cases of von Jaksch's anæmia, all in children aged about 2 years, and in the last three the percentage of these cells was distinctly above the normal; in the second

and third the number was raised, but not strikingly so. The first case died shortly after the examination was made. The second and third cases also died, and the only survivor showed the highest percentage of these abnormal cells. It led one to think that in cases of grave anaemia, in which the vital staining cells did not appear, one had some indication that the bone-marrow reaction was not taking place, and hence the prognosis was worse than it would otherwise be. In a case of anaemia in a child, with enlarged spleen, which appeared to be aplastic anaemia, the bone-marrow was found post mortem to be almost entirely replaced by lymphocytes, although no lymphocythæmia had been noted during life. The red cells were 500,000 on the day of death. The first time he examined that child the abnormal cells were slightly increased, and a blood count made shortly before death showed none of the abnormal cells at all. He had examined two interesting cases of pernicious anaemia, or cases which were so diagnosed. The patients were in beds side by side. They both showed a low red count, but a high colour index and poikilocytosis. One, however, looked more like the clinical picture of pernicious anaemia than the other. The percentages of the vital staining cells also differed in the two. The one with the high percentage had suffered from bleeding piles, and some blood loss had occurred from them recently. He said at the time that he thought the case with a high percentage of granular cells had a better chance of recovery than the other, and he told the physician in charge of the case his view. The case with the high percentage of granular cells did steadily recover; but the other case went from bad to worse, the granular cells became fewer than before, and the patient died. Post mortem it was found to be a characteristic case of pernicious anaemia. He had examined two cases of lymphatic leukæmia and two of myelogenic. The first case of lymphatic leukæmia was a very acute one, in a child, who had, in addition to enlargement of glands and spleen, nodules all over the body. Several examinations failed to reveal any vital staining cells, and death occurred within a few days of admission. Post mortem the bone-marrow showed the characteristic changes of lymphatic leukæmia; there was a very high leucocyte count in the blood during life. The other case of this condition was chronic, and he found the percentage of vital staining cells above the normal. The patient was at present doing well. One of the cases of myelogenic leukæmia was a very acute one, and was rapidly going downhill. He could not find vital staining cells. The other case had a rather high percentage of

them, and the patient recovered. From such clinical findings he thought it possible to draw useful deductions from observations on the vital staining cells. All the observed facts seemed to fit in very well with the idea that these granule cells in some way represented blood regeneration: either that they were immature forms of blood corpuscles, or that for some reason, when blood regeneration was in progress, these cells appeared in the blood. The method of examining the blood, for clinical purposes, was very simple; one smeared a slide with a solution of a lipid soluble stain, such as borax-methylene blue, and allowed it to dry. A very small drop of blood was received on to a coverslip and the coverslip dropped on to the smear of stain, and examined under oil immersion. The granules took up the stain almost immediately, and by using a square diaphragm the counting of one or two thousand red cells could be done at once.

Dr. F. PARKES WEBER hoped that in the course of time, and with the help of further clinical observations and research work, it would become possible to introduce the following classification of splenomegalies for therapeutic and surgical purposes:—

(a) Enlargements of the spleen in which the enlargement and structural or functional change in the organ were serving some useful purpose, that is to say, were beneficial to the patient under the given conditions.¹ In certain young animals, for instance, the spleen might play a part in compensatory hæmatopoiesis.

(b) Enlargements due to the presence in the spleen of tumours, cysts, &c., which were, or might become, injurious to the patient.

(c) Enlargements (or alterations in structure or function) due to the local presence of microbes, which were, or might become, injurious to the patient.

(d) Enlargements (or alterations) of the spleen connected with disorder or excess in the functional activity of the splenic tissue (such as excessive hæmolytic activity), which were, or might become, injurious to the patient.

The beneficial effect in some cases of splenectomy might be perhaps accounted for by the spleen having been harbouring (some as yet unrecognized) harmful microbes.

¹ Cf. also Moulinier, "Transformation myéloïde complète de la rate dans une intoxication subaiguë par la bichlorure de mercure," *Arch. de Méd. Navale*, Par., 1903, lxxx, p. 347.

The word *abnormality* might be substituted for *enlargement* of the spleen, since it was obvious that the same kind of abnormality might be present in a spleen of normal as in a spleen of excessive size.

In regard to Dr. Hutchison's classification, he pointed out that in the Gaucher type of splenomegaly the presence of the characteristic "clear cells" not only in the spleen, but likewise in the liver and bone-marrow, made it exceedingly doubtful whether the disease ought to be classified under tumours (endothelioma).

Dr. HUTCHISON, in reply, said the discussion had been an interesting one, but he did not know that it had carried them much further. The difficulty of classification was great, but he did not think Dr. Parker Weber's proposal would prove practicable. Every now and again one felt that one could make certain definite groups, and then a case turned up which seemed to defy any such grouping; it did not fit in with any of the types. Still, he was not inclined to take up such a pessimistic attitude as did Dr. Thursfield about the possibilities of diagnosis. By careful study and the application of modern methods, one could refer the vast majority of cases to one or other group. He admitted that there were intermediate cases which were very difficult to place. The extraordinary case which Dr. Lukis described showed there was a mixing-up of types every now and then, and that made the subject extremely complicated. He was sorry to find so few, in this discussion, went down to the fundamentals. For instance, given that acholuric jaundice was due to increased fragility of red cells, how was it that removal of the spleen affected that condition? How could the spleen increase the fragility of the red cells? These fundamental questions of pathology were what one wished to see studied more. The surgeons could help, because the surgery of the spleen was still in the stage of experimental pathology, the stage through which so many operations had had to pass. Experience would show how to improve technique on the one hand and how to select cases on the other. Meanwhile, he was willing to recommend splenectomy in cases which otherwise would go downhill, even if it were a case in which one would usually say it should not be done. Only thus could one learn the kind of cases in which the spleen could be removed with advantage. At the same time, cases must be closely studied before operation. Sir John Bland-Sutton, for example, used the term "splenic anæmia," from the

point of view of his (the speaker's) classification, rather loosely, so that it was not clear whether he was referring to cases of the infantile or the adult type. As regards the case in a child aged 5 years which Mr. Philip Turner described, he doubted whether it was really von Jaksch's anæmia. He would be sorry if it were to go forth that that case was to be taken as an encouragement to remove the spleen in von Jaksch's anæmia. Operation in that disease would be extremely dangerous, and many cases of von Jaksch's anæmia ultimately made a good recovery.

The discussion had been, to him, a very instructive one, and he hoped that by a careful collection and study of cases, and by the improvement of methods, more and more progress would be made in an understanding of the pathology of splenomegaly in childhood.

Section for the Study of Disease in Children.

January 23, 1914.

Dr. LEONARD G. GUTHRIE, President of the Section, in the Chair.

Case of Athetoid Movements in both Hands.

By T. R. WHIPHAM, M.D.

THE patient is a girl, aged $4\frac{1}{2}$ years, who has never been able to hold anything properly in either hand owing to athetoid movements (alternating pronation and supination together with flexion of the forearm), which become more marked when objects are grasped. She seems a fairly bright child, but did not begin to walk until she was $3\frac{1}{2}$ years old, though she is said to have cut her teeth and to have talked early. She is the first child of her parents and was born at full term after a difficult labour lasting two days, at the end of which forceps were employed under an anæsthetic. Immediately after birth she had to be revived by means of artificial respiration and brandy, and she is said not to have cried for the first two days. Marks from the instrument were present for a time on both sides of the face and at the back of the head. The condition is probably due to injury sustained at the time of birth.

Case of Kala-azar.

By T. R. WHIPHAM, M.D.

THE patient is a boy, aged 5 years, the eldest of three children, the others being alive and well. His father contracted kala-azar in Calcutta a year ago and died recently from that disease. There is no history of the patient having had any previous illness. In March, 1913, when in Calcutta, the boy was taken ill with fever and loss of appetite and seemed to lose flesh. The motions at that time were white, but otherwise normal. He arrived in England in June and the abdomen was

then for the first time noticed to be enlarged. He has lost weight rapidly since and the size of the abdomen has increased.

The child shows much wasting, especially in the limbs and chest, and is very anæmic. The cheeks have a hectic flush and the tongue is furred. The lymphatic glands in the neck, axillæ, and groins can be felt slightly enlarged. The thoracic viscera are normal. The abdomen is greatly enlarged and measures $24\frac{1}{2}$ in. in circumference. The liver dullness commences above at the nipple-level and the lower edge extends to 3 in. below the costal margin. The spleen is enormous, the anterior border reaching to the middle line, where a notch can be felt just above the umbilicus, while the lower pole fills practically the whole of the left iliac fossa. There is œdema of both feet and ankles. The blood count shows: Red corpuscles, 3,220,000 per cubic millimetre, and leucocytes 2,200, of which polymorphonuclears amount to 46 per cent., lymphocytes 38 per cent., large mononuclears 12 per cent., and transitionals 4 per cent.; the hæmoglobin is 66 per cent. The coagulation time is diminished, being twelve minutes (that of normal blood being eight to nine minutes). Leishman-Donovan bodies are present in the blood obtained by puncture of the liver, but have not been found in the peripheral circulation. The urine is normal and the motions are now of a proper colour.

The child has been under observation for six weeks, during which time he has had more or less continuous fever, though the temperature does not show now such wide variations as at first. For the first three weeks he lost considerably in weight, but has since picked up again.

DISCUSSION.

Dr. WHIPHAM remarked that the case was of interest in view of the discussion on splenomegaly which was held by the Section in December, 1913.¹ At that meeting none of the speakers referred to kala-azar as a cause of enlargement of the spleen, though the opener in the course of his remarks made reference to malaria under the heading of infective causes. The speaker gave a detailed description of the disease and pointed out that in most respects his case was a typical example, though it did not present the curious hyperpigmentation of the skin which was found in some instances. The Leishman-Donovan bodies, which were demonstrated in a blood film obtained by puncture of the liver, appeared in this case to be chiefly extra-cellular, and were present in considerable numbers.

¹ *Proceedings*, pp. 41-62.

Fleet-Surgeon P. W. BASSETT-SMITH, C.B., said that the chief interest in this case was the age, for in the Indian form of kala-azar the disease mostly affected adults, whereas in the Mediterranean it chiefly affected the children between the age of 1 and 5 years, as in this case. We now knew that cases of tropical splenomegaly, or as it would be better called, "parasitic splenomegaly," were found in China in the Yangtse region, from there across to Northern India, and by way of Arabia and the Sudan to Northern Africa and the Mediterranean area generally. In this range we saw every gradation of the disease. We saw here a child with the Indian or adult variety, and he had now under treatment in the Dreadnought Hospital an adult with the so-called infantile form; these distinctions were gradually breaking down, one form merging into the other. In the Navy they had had a fair number of cases of splenomegaly. He had had two cases from South Africa, one from China, one from India, and now one from the Mediterranean, but in only two were they able to demonstrate the bodies, as the patients objected to any operative measures, without which no absolute diagnosis was possible. For diagnosis a splenic puncture was not without danger. When the peripheral blood failed to show any Leishman bodies, as was most usual, the liver tissue might very probably show them, but they were most abundant in the spleen and might be demonstrated from there, as he had found after two unsuccessful liver punctures. Patton and Donovan found the bodies in 100 per cent. of these cases, on examination of the peripheral blood in India, but others generally failed. Dr. Whipham had asked about treatment. The mortality was 96 per cent. The only European cases he knew of that had been cured were one of Manson's, who was nearly poisoned with atoxyl, and one case of Leishman's, in which the patient after a severe X-ray burn developed a high leucocytosis which possibly caused the parasites to be phagocyted. One patient of his own, admitted almost *in extremis*, recovered to such an extent under atoxyl that he was able to return to Australia without trouble, but finally died there. Another patient was now holding his own under atoxyl, 5 gr. intramuscularly every fourth day, nine months' treatment, but the prognosis was necessarily bad.

Case of Malaria in an Infant.

By FREDERICK LANGMEAD, M.D.

A GIRL, aged $3\frac{1}{4}$ years, the daughter of a soldier recently stationed in India. Until September 5, 1913, she was quite well, but at that date vomiting commenced and she began to "look ill," according to the mother's statement. On September 7 she had a shivering attack, and similar attacks occurred every forty-eight hours until admission on September 16. Each attack was succeeded by vomiting. Between

the attacks she appeared well, except for occasional abdominal pain. She was constipated after the onset of the illness. After September 12 she became weaker, was restless by night, the shivering ceased but the sickness continued. She complained of headache, and wasted considerably.

One year before, while in India (Dinapur), she had had severe diarrhoea and vomiting. There was much dysentery and some malaria at the station at the time. She returned from India in November, 1912. The mother had malaria while the child was being breast-fed.

On admission she was seen to be a pale, sallow, but fairly well nourished child. Her skin was slightly icteric. The spleen reached downwards for four fingers' breadth below the costal margin and the liver for two fingers' breadth. Under treatment by quinine the spleen appreciably diminished. Examination of the blood (Dr. Nabarro): Benign tertian parasites present in fair numbers, large intracorpuseular forms being seen. The red corpuscles varied much in size. Some polychromatophilia was present.

She has improved and the spleen has diminished. Rigors recurred on September 28 and 29.

DISCUSSION.

Dr. LANGMEAD said that he had brought the case before the Section as a companion case to that of Dr. Whipham, and because members of the Section did not often have an opportunity of seeing examples of the condition in babies. There was nothing rare or unusual about it.

Dr. W. J. MIDELTON spoke of a case which had recently been under his care. The patient was an adult male, aged 40 years, who had suffered from malaria, dysentery, Java fever twice, dengue, gonorrhoea, syphilis, &c. He ultimately developed disseminated sclerosis and became anæmic, dyspeptic, despondent, and so crippled that he could only walk short distances with crutches. He had periodical attacks of vomiting and explosive diarrhoea. The colon was considerably dilated and atonic. After a prolonged course of treatment by means of multiple acupuncture with irritants he completely regained his health and spirits and could play croquet. Dr. Eyre, of London, carried out a Wassermann test of the blood which proved negative (after treatment). Dr. A. C. Coles, of Bournemouth, also at the termination of treatment examined the blood and found red cells normal in size, colour and number; white cells normal in number and proportion of each kind. No parasites or "taints." He had treated several children suffering from diseases of the skin and other ailments with most gratifying results, and saw no reason why it should not be tried in kala-azar or malaria.

Abnormal Cysts on Shoulders.

By ERIC PRITCHARD, M.D.

THE patient is a twin, aged 6 weeks. The mother was confined at home and was attended by a midwife; the first of the twins was delivered head first; in this one the presentation is said to have been that of a shoulder (left). The midwife, without calling in assistance, performed version, and immediately after birth the two cystic swellings were observed on the left shoulder in the position which they still retain. The infant was brought to my Infant Consultations when it was aged 8 days. At this time the two cystic swellings were slightly larger than they are at present. Although each fluctuated freely on palpation they did not appear to communicate. They were stated to have increased in size since birth. Three cubic centimetres of the fluid were drawn off with a hypodermic needle; it was blood-stained and partly coagulated on standing. The swellings appear to be of the nature of abnormal and persistent capita succedanea.

DISCUSSION.

Dr. PORTER PARKINSON was surprised at the extreme rarity of these cases. He had never seen one previously. Whatever the first condition had been, he considered that now there were two hæmatomata filled with clotted blood. He would like to ask Dr. Pritchard if any cases of hæmophilia had occurred in the family.

Dr. AMAND ROUTH knew of no instance of a caput succedaneum persisting for more than thirty-six hours, apart from a co-existing hæmatoma, and thought that the two semisolid tumours on the shoulder of the child had been there before birth, and like, other abnormalities, such as spina bifida, encephalocele or extroverted viscera, had actually presented at the onset of labour. They were possibly of the nature of hygromata.

Dr. F. PARKES WEBER thought that the condition of the child's arm might certainly be one of cystic lymphangioma. Cystic lymphangioma did not occur exclusively in the form and situation of congenital hygroma of the neck.

Dr. PRITCHARD, in reply, said he did not regard this as a case of hæmatoma, and chiefly for the reason that both swellings were quite translucent on the eighth day, and the fluid withdrawn only slightly stained with blood. In spite of what had been suggested, he still felt uncertain as to what treatment to apply.

Specimen of Double Hydro-ureter (Congenital) in an Infant.

By ERIC PRITCHARD, M.D.

PATIENT, when aged 7 months, was brought to the Queen's Hospital for Children for wasting, diarrhoea and vomiting. Parents healthy; one previous child died, aged 7½ months, from meningitis. The patient was delicate from birth, and had been partly breast-fed and partly bottle-fed. Till within two days of admission nothing abnormal had been noticed with respect to the passage of urine, but during the previous forty-eight hours the quantity of urine passed was very scanty—a fact which was explicable on the ground that the baby had taken very little fluid. The bowels, which had been loose since birth, had been extremely relaxed during the last three weeks, and the stools were greenish. Vomiting had been a marked feature for some days before admission.

After admission a very small quantity of urine was passed, which showed a thick precipitate on standing, a large quantity of pus, and motile bacilli in clumps (coli). The bladder was not distended, but two cystic swellings could be palpated internal to the superior anterior iliac spine; these were easily palpated through the rectum and were diagnosed as dilated ureters.

Post mortem: Both ureters were found enormously dilated, and the pelves of the kidney greatly enlarged, while the kidney substance was very much thinned out. The opening of the right ureter was greatly contracted, while that of the left, though very small, admitted a fine probe.

The cause of the obstruction appears to have been due to the valve-like pressure of the dilated ureters acting on the orifices of the ureters, the primary dilatation of the ureters being probably due to a congenital atresia of the two ureteral orifices. Death was due to the secondary infection of the ureteral contents.

Case of Polio-encephalitis.

By J. WALTER CARR, M.D.

THE patient is a boy, aged 7 years. He lives in the country, and it has not been possible to obtain a satisfactory history, but he is said not to have had any important illness until the present one, which commenced early in October, 1913, with a bad attack of diarrhoea, severe

headache, and pains in the limbs. The boy became unable to stand or speak, and could only say "Mum"; he also appeared to be blind. His intelligence had previously been normal. After about five weeks he began to improve, could see a little, and say simple words.

He was admitted to the Victoria Hospital for Children, Chelsea, on December 2, 1913. He was then fairly well nourished, but could not stand alone, and apparently could only see very imperfectly, especially towards his left side. His manner was strange, and suggested a high degree of mental deficiency; he understood what was said to him, but spoke slowly and indistinctly and was unable to name familiar objects. Mr. Devereux Marshall reported that both optic disks showed marked evidence of a subsiding neuritis. All movements of the arms, especially the left, were performed with extreme clumsiness and inco-ordination, so that he had much difficulty in getting hold of objects.

Since admission he has greatly improved. His mental condition is much better; he takes notice and can name objects, but still has occasional incontinence of urine and fæces. The optic disks are somewhat pale but otherwise normal. His sight now seems quite good: there has been no squint or nystagmus. He can walk a little, but with a somewhat staggering and uncertain gait, especially when he turns round. His legs are perhaps slightly spastic and the knee-jerks brisk, but there is no ankle clonus or extensor plantar reflex. He still has considerable difficulty in performing co-ordinate movements with his arms, especially the left, and consequently can scarcely feed himself. The Wassermann and von Pirquet reactions are both negative.

The case appears to be one of polio-encephalitis affecting the cerebellum, especially the left lobe, and probably also the occipital lobes of the cerebrum.

Case of (?) Insufficiency of Endocrinic Glands.

By F. G. CROOKSHANK, M.D.

G. M., MALE, is the elder child of a father now aged 38 years and a mother who is aged 40 years. Both parents are believed to be healthy. G. M., who is now aged 32 months, is an apathetic and flaccid infant, who does not speak and seems to have extremely little initiative. Some of the features are suggestive of Mongolism; there is a marked Hapsburg lip. The vault of the nasopharynx is very small and the

respiratory system generally poorly developed. The upper part of the trunk and the arms are relatively less developed than the belly, which is protuberant, and the legs, which are large and shapeless, though less burdened with flabby fat than was the case six months ago. The external genitals are quite trifling. There is a marked dimple above the anus.

For some weeks during 1913 G. M. was given thyroid and thymus tablets, and improved. Lately he has not been seen regularly, for he has been kept indoors by his mother, since he suffers much in cold weather from catarrh of the respiratory passages and "poor circulation."

It may be thought that the child has, in addition to some degree of Mongolism, some pituitary as well as genital insufficiency; and it is proposed to continue treatment with combined pituitary, thyroid and thymus substance.

Dr. CROOKSHANK said that he had been much interested in hearing from so many authorities the expression of opinion that this case was a "typical Mongol"; although, while some said the head was characteristic of Mongolism others said it was not, and others again that it was rickety. He thought that we were in some danger of forgetting that Dr. Langdon Down originally applied the term "Mongolian" to certain cases because they displayed certain physical traits of racial Mongolism. Yet when he (Dr. Crookshank) showed before the Section last year¹ a boy of European parentage so characteristically Mongolian in appearance that he was habitually accosted by Japanese in their own language, it was generally held by members of the Section, and more particularly by those who had not travelled in the East, that there was no sign of "Mongolism" present. On the other hand, the case shown that afternoon manifested only two traits of racial Mongolism—to wit, epicanthus (in a slight degree), and the Hapsburg lip, seen, it was true, so often in Mongol children and Asiatic apes. But what did appear to him of some importance was, that the case under discussion showed three marks of hypopituitarism—a small lower jaw, very small genitals, and a marked excess of fat on the limbs and body. He was quite willing to agree that not a few pathological Mongols did display in degree these signs; but, if it were suggested that these points were, as some had said that afternoon, characteristic of pathological Mongolism, it would seem difficult to escape the conclusion that, in this condition, there was often some degree of hypopituitarism. The present child had improved considerably on thyroid and thymus substance, and was now commencing to take "tabloids" of thymus, thyroid and pituitary that Messrs. Burroughs Wellcome and Co. had made up some time ago, at special request.

¹ *Proceedings*, 1913, vi, p. 133.

Lymphocytic Leukæmia under Treatment by Benzol.

By H. D. ROLLESTON, M.D., and E. J. BOYD.

A BOY, aged $6\frac{1}{2}$ years, has had two attacks of measles, the last followed by pneumonia eight months ago, after which the heart was affected and enlargement of the lymphatic glands in the neck, at first regarded as tuberculous, was noticed.

On admission to the Victoria Hospital for Children on December 11, 1913, he had puffy eyes, some œdema of the forehead, more marked on the right side, and numerous enlarged and hard glands in the neck, parotid and submaxillary regions, axillæ, and groins. The spleen was just palpable. The mouth and tonsils were natural. A systolic apex murmur and Eustace Smith murmur were present, but radiography did not show any intrathoracic glands. The blood showed 60,000 leucocytes, and the differential count: lymphocytes, large, 54 per cent., small, 16.5 per cent.; polymorphonuclears, 25 per cent. *Liquor arsenicalis*, 4 minims t.d.s., and naphthalene tetrachloride, 3 gr. t.d.s., were given. The arsenic was continued until December 29, when benzol, 2 minims in mist. petrolei t.d.s., was substituted. The naphthalene was continued until January 15, when it was omitted. On January 6 the leucocyte count was 51,000, with a differential count of lymphocytes: large 53 per cent., small 30 per cent.; polymorphonuclears, 13 per cent. On January 10 the dose of benzol was increased to 4 minims t.d.s., and on January 13 Dr. S. Wyard, who made all the blood counts, reported red blood corpuscles 4,300,000, leucocytes 16,000, lymphocytes, large 41.5 per cent., small 46 per cent., polymorphonuclears 10 per cent. [On January 24, the day after the case was exhibited, the red blood count was 3,560,000 and the hæmoglobin 50 per cent. The red corpuscles showed anisocytosis and very well marked poikilocytosis. Two large nucleated reds were seen. The total leucocyte count was 20,000; lymphocytes—large, 26, small, 24; polymorphonuclears, 39; eosinophiles, 1; hyaline, 7, and transitionals, 3. In a count of 200 leucocytes one myelocyte was seen. The liver had now become somewhat enlarged. On February 13 the total leucocyte count was 4,000.] The temperature has been normal throughout, no purpura has been noticed, and the pulse-rate has varied from 74 to 104. The urine is normal. The spleen has sometimes been palpable, sometimes not; the condition of the enlarged glands has remained unchanged. There is no evidence

of enlargement of the lachrymal glands, but, as suggested by Dr. Thursfield, the case may be an anomalous example of the form of leukæmia resembling Mikulicz's disease.

The treatment of leukæmia by benzol was originated by von Korányi,¹ who based it on Selling's² clinical and experimental observations, that benzol poisoning produces leucopenia, which persists after the cause is removed. Clinically, benzol poisoning causes purpura hæmorrhagica, aplastic anæmia, almost complete absence of blood platelets, and progressive leucopenia. In Selling's two fatal cases the total leucocyte count fell to 480 and 140 per cubic centimetre. Benzol appears to inhibit the leucoblastic tissues. Barker and Gibbes³ have recently collected fourteen cases of myeloid and three cases of lymphocytic leukæmia treated by benzol; and since then Parkes Weber⁴ reported the failure of benzol in a man with myeloid leukæmia, and Calvert⁵ a case of chronic lymphocytic leukæmia successfully treated by benzol; in this patient, a man, the total leucocyte count gradually fell from 128,000 to 6,000. The effect of benzol appears to be less rapid than that of X-ray exposures. A point of interest in our case is that the patient is a child with chronic lymphocytic leukæmia.

DISCUSSION.

Dr. F. PARKES WEBER said that at the December meeting of the Clinical Section⁴ he showed an adult patient with chronic myeloid leukæmia (the old type of "spleno-medullary leucocythæmia"), whose symptoms had not improved whilst he was kept under benzol treatment. When Röntgen rays were employed his symptoms immediately commenced to improve. The present patient of Dr. Rolleston was probably one of the youngest leukæmic patients that had as yet been treated with benzol. In regard to the question of calling the case one of "anomalous Mikulicz's disease" (because of the salivary glandular swelling), it was known that some cases of Mikulicz's disease, or rather symptom-complex, were in reality cases of leukæmia. The presence of lymphatic leukæmia appeared certain in Dr. Rolleston's patient.

Dr. EDMUND CAUTLEY pointed out that there were several unusual features in this case. The chronic type of lymphatic leukæmia was more rare even than the acute type in children, and was generally one of predominance of

¹ Korányi, *Berl. klin. Wochenschr.*, 1912, xlix, p. 1357.

² Selling, L., *Bull. Johns Hopkins Hosp.*, Balt., 1910, xxi, p. 33; *Beitr. z. path. Anat. u. z. allg. Path.*, Jena, 1911, li, p. 576.

³ Barker and Gibbes, *Bull. Johns Hopkins Hosp.*, Balt., 1913, xxiv, p. 363.

⁴ Weber, Parkes, *Proc. Roy. Soc. Med.*, 1914, vii (Clin. Sect.), p. 39.

⁵ Calvert, J., *Proc. Roy. Soc. Med.*, 1914, vii (Clin. Sect.), p. 41.

the small lymphocytes, rather than the large lymphocytes, though mixed varieties occurred. He drew attention to the distinct enlargement of the left parotid gland and to the fact that the submaxillary lymph nodes, not the submaxillary salivary glands, in his opinion, were also markedly enlarged, much more so than the glands elsewhere. He did not attach any importance to the treatment by benzol, seeing that so many patients improved temporarily in hospital as the result of good food, hygiene and nursing.

Fracture of an Incisor Tooth ; Dental Cyst.

By PHILIP TURNER, M.S.

J. F., AGED 12 years, had a fall two years ago and fractured one of the right upper incisor teeth. Three months ago a swelling of the right upper jaw was noticed. This has increased slightly since then. There is now a well-marked bulging forwards of the facial aspect of the right superior maxilla. Digital pressure in the region of the canine fossa gives typical "egg-shell crackling." The hard palate on the right side is depressed, and there is widening of the anterior part of the alveolar process. There is no exophthalmos and no nasal obstruction or discharge from the right nostril. The right central incisor is fractured and the pulp exposed; the right temporary canine has not been shed and is loose. A skiagram shows that the pulp cavity of the fractured tooth is exposed, and that the apex which is imperfectly formed projects into the cyst cavity.

Case of Deformity of the Spine of (?) Congenital Origin.

By LIONEL E. C. NORBURY, F.R.C.S.

W. W., FEMALE, aged $5\frac{1}{2}$ years, was brought to the Belgrave Hospital with history of pain beneath the left costal margin of some two to three weeks' duration. On examination: Healthy-looking child. Prominence of lower dorsal and first lumbar spinous processes. Slight mid-dorsal lateral curvature with convexity to the left. Movement of spine good. No pain elicited on "jarring" spine. No alteration in length of limbs. No abnormal physical signs in chest. Von Pirquet's reaction slightly positive. X-ray examination reveals wedge-shaped condition of first and second lumbar vertebræ, and the interval between these is less than between the bodies of adjacent vertebræ. The skiagram suggests the presence of an extra-lumbar vertebra.

Dr. LANGMEAD said that he had met with a difficulty in diagnosis very similar to that mentioned by Mr. Norbury. It was in a case of congenital scoliosis in a girl, aged 10 months,¹ and the difficulty was enhanced by the fact that a brother had died of spinal caries when aged 1 year. The father had phthisis, and a sister tuberculous adenitis. The mother presented the baby for treatment as a case of "tuberculous spine," similar to that of the brother. A skiagram revealed the nature of the scoliosis. Between the last dorsal and first lumbar vertebræ was an extra bone, which was wedge-shaped, the base of the wedge being to the left. He asked Mr. Norbury for information as to the rarity of the condition. Mr. D. C. L. Fitzwilliams had only found thirteen examples of so-called congenital scoliosis in the literature, and of these only five were diagnosed in living children. He had himself seen two cases of the kind, and was under the impression that the condition was far commoner than the literature would lead one to suppose. In the second case many ribs were abnormal also, several being fused together at various places along their shafts and also joined at their vertebral attachments, together articulating with the spine.

An Unusual Case of Jaundice, with Specimens (Subacute Yellow Atrophy of Liver).

By J. PORTER PARKINSON, M.D.

A BOY, aged 3 years, was admitted into the Queen's Hospital for Children on November 18, 1913. He had had measles a year previously. The family history was a very good one. Three weeks before admission he had a rigor, followed by fever; he improved, but had a relapse. Jaundice appeared on November 15, and he became very drowsy.

On admission he was found to be a well-nourished boy with well-marked jaundice. The tongue was coated, the stools pale. The liver was enlarged, reaching 1 in. below the costal margin. The spleen was just palpable. The urine contained much bile, but was otherwise normal. The heart, lungs, and nervous system were normal. The child seemed quite comfortable, and the temperature was normal till November 28, when it rose rapidly to 103° F., and remained high till December 3, when it fell again to normal. During all this time there were no signs to account for the temperature. An X-ray examination of the chest was negative, and there was no nervous symptom.

On December 12 some pleural friction sounds were heard over the base of the right lung, and the liver edge had gone down as far as the umbilicus; the jaundice still persisted. The liver then began to lessen in size, and this continued till the day of death.

¹ *Proceedings*, 1910, iii, p. 130.

On December 28 a blood culture showed a slight growth of *Staphylococcus albus*, but, owing to the great difficulty of obtaining the blood, this was thought likely to be a contamination. About this date the abdomen was rather rigid, but otherwise normal, and the spleen could not now be felt. Some œdema of the feet and hands appeared. There was no delirium or other nervous symptom. The temperature, which had been normal since December 5, rose again to 103° F. on December 23, and continued at this height till death on December 31. The urine never contained any abnormal bodies, such as leucin and tyrosin.

At the necropsy the lungs showed a patchy congestion and numerous small septic infarcts, none larger than the head of a blanket-pin. There were recent pleural adhesions at the base of the right lung. The bronchial glands were soft and enlarged. The heart was dilated, soft, and flabby. There was slight thickening of the mitral valve, but no vegetations. The peritoneum contained 5 oz. of a yellow fluid. The liver was slightly enlarged and pale brownish-yellow in colour: a simple plastic peritonitis was round the portal fissure. Gall-bladder shrunken but ducts patent. The liver shows areas of a yellow colour, apparently due to extreme fatty change, mingled with areas of a reddish colour, sharply defined from the former and harder to the feel. The sub-diaphragmatic surface shows small white bodies resembling tubercles, but which were probably infarcts. The spleen was enlarged and contained one septic infarct. The kidneys were soft and pale, and contained several small infarcts in each. I am showing the liver and microscopic preparations from it.

I suggest that the case was one of subacute yellow atrophy of the liver, having a prolonged duration. The clinical and pathological evidences are in favour of this, and the absence of leucin and tyrosin from the urine are not unusual.

Microscopic Report.—The small abscesses in the lungs contain staphylococci, probably identical with those obtained from the circulation during life. The liver shows general fatty degeneration of the liver cells with increase of the interstitial connective tissue in and around the lobules, with much young connective tissue splitting up the columns of liver cells into islets. The red part of the liver consists almost entirely of young connective tissue and closely set capillaries resembling a capillary angioma. Scattered through it are small isolated masses of liver cells containing fatty granules. There are also small masses of cells showing a central duct, apparently pointing to some attempt at regeneration of tissue. No spirochaetes were present in the liver.

The general appearances resemble those described in their similar cases in children by Messrs. M'Donald and Milne in the *Journal of Pathology*.¹ Only two previous cases of this disease in children have been described before this Section. In 1906² I described an acute case lasting only nine days in a boy aged 4 years; this was in every respect like the usual adult type. Another was described by Dr. Bertram Rogers in the same year.³ A peculiarity of the present case is its long duration, the boy being taken ill with jaundice nine weeks before his death. The advent of fever without obvious cause led one to suspect yellow atrophy, though none of the usual nervous or toxic symptoms were present. The absence of leucin and tyrosin from the urine is not unusual in this disease.

My thanks are due to Dr. Woodforde for the pathological report and specimens, and to Dr. Chisholm for various suggestions.

Dr. F. PARKES WEBER said that the portion of the section of liver which he saw under the microscope probably showed recovery and regeneration of the hepatic cells. This would confirm Dr. Parkinson's opinion that the case was one of *subacute hepatic atrophy*, during which there was time for regenerative changes to occur in portions of the liver. There were, however, none of the tumour-like nodules ("compensatory adenomata") seen in some regenerative livers.

Two Cases of Transitory Diabetes Insipidus.

By LEONARD GUTHRIE, M.D., and G. A. SUTHERLAND, M.D.

CASE I.

T. K., AGED 2½ years, was admitted to hospital on October 10, 1913, with a history of diarrhoea, off and on, for three weeks; motions foul-smelling, occasional vomiting. Had been extremely thirsty but did not want any food for a week.

On admission: A poorly developed boy, looking very ill and miserable. Extremities and ears blue and cold. Skin very dry and inclined to peel, purpuric rash on chest and thighs. Tongue very red but clean. Heart and lungs normal. Abdomen flaccid, not distended. Liver enlarged to 1½ in. above the umbilicus. He was very drowsy and extremely thirsty. Urine, of which he passed large quantities mostly into the bed, was of specific gravity 1004, contained no sugar or albumin, but a trace of

¹ *Journ. Path. and Bact.*, Camb., 1909, xiii, pp. 161-73.

² *Rep. Soc. Study Dis. Child.*, 1906, vi, p. 229.

³ *Ibid.*, 1906, vi, p. 294.

acetone. The bowels acted three or four times daily. The motions were of the consistency of porridge, and of a peculiar slaty or bluish-grey in colour. They contained large numbers of *Bacillus pyocyaneus*, and also *Bacillus coli*, *Bacillus acidi lactici*, *Bacillus lactis aerogenes*, *Staphylococcus aureus*, yeasts and moulds. The pancreatic reaction was negative. The peculiar appearance of the stools lasted for three days.

Progress: For three weeks he remained in a prostrate condition, cold and slightly cyanosed, pulse feeble (90 to 130), temperature 99° to 100° F. He was dozing all day, only waking every half-hour, calling for water, drinking it greedily, and then sleeping again. He consumed about 12 pints of water a day and passed large quantities of urine, the exact amount of which could not be ascertained. It remained of low specific gravity (1004 to 1006) and contained neither sugar nor albumin. The motions became lighter in colour and gradually normal, though containing undigested food for many days. At the end of the third week the drowsiness, thirst, and polyuria subsided. He developed a voracious appetite for about a week, and rapidly became convalescent.

CASE II.

R. H., aged 2 years, was admitted to hospital on September 9, 1913, as a case of (?) "meningitis."

History: Diarrhoea, off and on, for three weeks, motions watery and very foul-smelling. At times he would seem quite well and at others "like a dead child." For two days unable to sit up or hold up head. Had vomited on first day of illness but not since.

On admission: A poorly developed child, looking very ill. Unable to sit or keep head erect without support. Drowsy and apathetic, submitting to examination and falling asleep as soon as it was finished. Skin dry and showing dirty yellow generalized pigmentation. Muscles very flabby. Abdomen distended but very soft, faecal masses felt in descending colon. Liver felt 1 in. above the umbilicus and spleen 1 in. below ribs. Motions loose and putty-coloured, odour offensive. Urine, specific gravity 1006, containing no sugar and no albumin, but a trace of acetone, was passed in large quantities. The child was very drowsy and thirsty, calling for drink every half-hour and falling asleep as soon as he had taken it. The condition of drowsiness, thirst, and polyuria lasted for twelve days, during which the diarrhoea continued, and he seemed very ill and miserable. The temperature was normal, with occasional rises to 100° or 101° F. At the end of a fortnight he was much better, no longer drowsy or thirsty, and passing a normal amount of urine of specific gravity 1020. Diarrhoea gradually ceased and the

motions became normal. As the symptoms subsided he became excessively hungry, rapidly put on weight, and was discharged convalescent from hospital on October 24, six weeks after admission.

Remarks.—We are unfamiliar with similar cases of transitory diabetes insipidus in children. Both patients presented so many features in common that they must be regarded as suffering from one and the same affection. Both children looked pictures of abject misery and were obviously extremely ill for two or three weeks after admission. Thirst was very marked in both. Each would call for drink every half-hour and would take about a pint of water at a time, only stopping once to draw breath meanwhile. Unless allowed to have as much as they wanted they would cry till they got more. Polyuria was equally remarkable. The amount could not be measured, but the beds were continually swamped with urine. The collected urine was of low specific gravity (1004 to 1006), pale and containing a trace of acetone, but otherwise normal. The specific gravity rose to 1020 as convalescence was established. Drowsiness was constant and peculiar. During the stage of thirst and polyuria each patient would only wake up to ask for drink and immediately fall asleep again. The motions in each case were offensive, loose, and unformed, but there was no excessive diarrhoea to account for the thirst. The peculiar slaty-blue colour of the fæces in Case I was probably due to the presence of *Bacillus pyocyaneus*. The skin in each case was remarkably dry and unhealthy looking. Yellowish pigmentation was present in one and a purpuric eruption in the other. Bulimia: In each case as the thirst, drowsiness, and polyuria passed off the appetite became voracious for a week or two. Each patient would demand dinner half an hour after a good breakfast. The bulimia was as prominent as the polydipsia and ceased as convalescence took place. The extreme drowsiness favours the view that these were cases of true diabetes insipidus and not of polydipsia alone. A possible explanation is that the intestinal derangement present in both cases set up toxæmia which, acting on the kidneys, prevented the output of waste products, and thus gave rise to uræmic drowsiness. According to Erich Meyer, the essential error in true diabetes insipidus is inadequacy on the part of the kidneys to excrete urine of more than a certain very low concentration. In order to secure the excretion of solid waste enormous volumes of water are required. Another explanation is that the symptoms were due to toxæmic affection of the vasomotor centres and sympathetic system, or perhaps of the pituitary body.

We are indebted for the notes to Dr. Hay, House Physician at Paddington Green Children's Hospital.

Section for the Study of Disease in Children.

February 27, 1914.

Dr. LEONARD G. GUTHRIE, President of the Section, in the Chair.

Incurvate Little Fingers in an Afro-Aryan Child.

By F. G. CROOKSHANK, M.D.

D. C., AGED 3 years, has been under treatment for rickets, somewhat irregularly, during the last fifteen months. When first seen, as now, the incurvation of both little fingers was marked. This morphological character, although most often spoken of in connexion with Mongolism, is really, as has been noted by Keith and others, to be seen in the young of every primitive human race, and of all anthropoids. Its relation to Mongolism is therefore general, and not peculiar. D. C. is the offspring of a male African negro and a female Cingalese, and is therefore without any trace of racial Mongolism. A year ago her eyes most resembled those of a negro baby. They are now full, like those of the Cingalese and some other "Aryans."

Dr. COCKAYNE agreed with Dr. Crookshank that the condition bore no special relation to Mongolism. It was not infrequently hereditary. He had met with one family in which it occurred in several members of both sexes, and others had been recorded.

Case of Pre-adolescent Dyspituitarism.

By F. G. CROOKSHANK, M.D.

B. H., MALE, aged $13\frac{1}{2}$ years, now weighs $10\frac{1}{2}$ st. He appears to be in good health generally, but it is said that it is only in the last six months that he has become so fat. His father is over 6 ft. in height, and the mother, who is dead, is said to have been a very stout woman. The lad has, according to Mr. Letchworth, who has kindly examined him, some definite limitation of the temporal half of the right visual field. A skiagram of the skull showing the sella turcica is exhibited. Sugar tolerance has not yet been estimated. The boy is obviously very stout, but the distribution of the fat is feminine, and the external genitals are small. Associated with these characters there would seem to be some skeletal overgrowth. The size of the pelvis is notable. On the whole the case appears to correspond to the type described by Cushing as differing from Fröhlich's dystrophia adiposo-genitalis in the skeletal overgrowth and in the markedly feminine distribution of the fat.¹

Extensive, Cicatricial, Pharyngeal Diaphragm following Scarlatina.

By J. F. O'MALLEY, F.R.C.S.

J. C., A BOY, aged 5 years, came to my clinic at the Evelina Hospital recently, with a history of having had scarlatina two years ago, for which he was in a fever hospital for about three months. He could speak distinctly before his attack of fever, but on returning from the hospital it was noticed that he "spoke through his nose," and the condition has become worse since then. He can swallow solids and liquids without difficulty, and there is no history of interference with breathing. He has bilateral chronic middle-ear suppuration, which has persisted since the attack of fever. Both membrana tympani are destroyed, and there is pus and granulation tissue in the middle-ear cavities.

¹ "The Pituitary Body and its Disorders," pp. 175 and 177.

On examination of the throat one sees a diaphragm, appearing as a continuation downwards of the soft palate, and formed by the union of the free edges of the two posterior pillars. It shuts off the nasopharynx from the oro- and naso-pharynx, and is complete except at the centre of its upper and lower borders. The upper opening is a small space surrounding the normal uvula, in which the latter is free to move. At the lower border there are two openings, one on each side of a central adhesion, which passes obliquely downwards and backwards to the right, and is attached to the posterior wall of the pharynx, opposite the level of the epiglottis. The anterior pillars, at their upper ends, blend with the new diaphragm, whilst the lower ends are normal. Behind the latter, and on the anterior aspect of the new formation, the tonsils can be seen, appearing rather superficial, owing to the partial obliteration of the sinus tonsillaris.

The method of formation of these cicatrices is a matter of some interest. They appear to arise in the following manner: There is an intense inflammation with infiltration and oedema of the posterior pillars which brings the two sides into contact. The palato-pharyngeus muscle is at the same time in a state of paresis due to a myositis, and in consequence the pillars remain in apposition. The epithelium on the opposed surfaces becomes denuded and hence the adhesions readily form. One can frequently see various stages of this process in syphilitic disease, but no adhesions which have met across the middle line as in this case.

Suggestions were invited as to the best method of treating the case, as the prompt recurrence of the adhesions, after simple division, was the invariable experience.

Dr. J. D. ROLLESTON said that the case was one of great interest. He had never seen a similar case himself nor found one in the literature. As a rule necrotic angina in scarlatina ended fatally or recovery took place without deformity. Felt,¹ of Philadelphia, many years ago, in a description of a case of scar tissue in the pharynx following scarlet fever, said that any attempt to remove the scar tissue would be futile. More recently Oppikofer,² of Bale, had collected five cases of stricture of the œsophagus following scarlet fever and had suggested that some cases of œsophageal stricture of unknown ætiology whose origin dated back to childhood were probably due to scarlet fever. In Preleitner's case³ stricture of the œsophagus was associated with cicatricial lesions in the pharynx. It would have been interesting to have known the

¹ *Laryngoscope*, St. Louis, 1898, 7, p. 91.

² *Arch. f. Laryng.*, Berl., 1911, xxv, p. 182.

³ *Wien. klin. Woch.*, 1910, xxiii, p. 681.

bacteriological condition of the throat in Mr. O'Malley's case during the acute stage, in view of the fact that some destructive throat lesions were associated with the symbiosis of Vincent's organisms. In such cases the local application of salvarsan was of great service. Dr. Rolleston had recently shown a case of Vincent's angina at the Clinical Section,¹ where this treatment had been most successful, and the same method had been recommended for the necrotic angina of scarlet fever by Netter in Paris,² and Schreiber³ in Germany.

Case of Cyst of the Cæcum in a Child, aged 3 Months, causing Intestinal Obstruction; Resection of Intestine; Recovery.

By W. GIRLING BALL, F.R.C.S.

A MALE child, aged 3 months, was admitted to St. Bartholomew's Hospital, under my care, on June 3, 1913, with a history of intestinal obstruction during the previous forty-eight hours. Mention was made of several attacks of screaming, associated with abdominal rigidity. The bowels were opened by enemata, and relief appeared to be given. The pulse-rate and temperature were normal. Next day the bowels were opened naturally, and the motions were natural in all respects. In the late afternoon it was noticed that the abdomen was becoming distended, and several screaming attacks occurred. Then, for the first time during a period of quiet, a swelling was felt in the right iliac fossa. Nothing felt *per rectum*.

A diagnosis of intussusception, causing partial intestinal obstruction, was made.

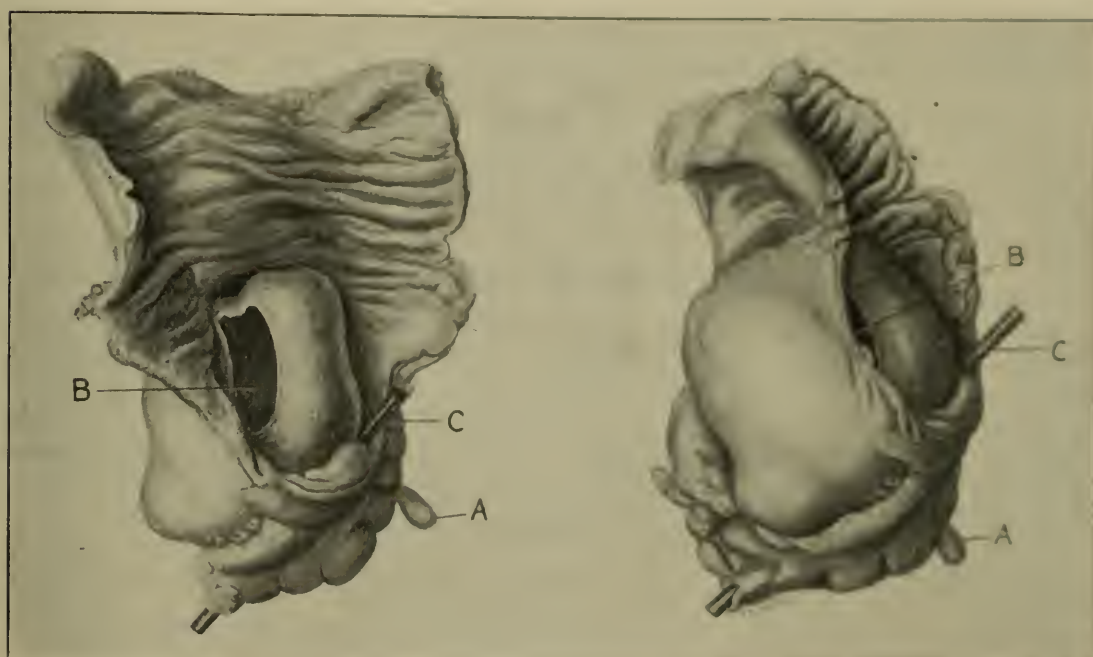
On opening the abdomen, the swelling was seen to be situated in the cæcum. The appendix was lying free, and not involved in the swelling. It was still thought to be an ileo-colic intussusception, until it was found to be impossible to reduce it. The colon was then opened beyond the swelling, and it was seen that it bore no relation to the ileo-cæcal valve, beyond blocking the orifice. It was a tensely distended cystic swelling, attached to the outer and posterior wall of the cæcum. The hole was closed. The lower 3 in. of the ileum, the cæcum and its

¹ *Practitioner*, 1913, xci, p. 847.

² *Bull. et mém., Soc. méd., Hôp. de Paris*, 1912, xxxiv, p. 91.

³ *Verhandl. d. Deutsch. Kongr. f. inn. Med.*, Wiesb., 1913, xxx, p. 142.

contained cyst, and about 2 in. of the ascending colon were excised. The open end of the colon was closed, and the lower end of the ileum left open with a Paul's tube inserted, in order to relieve the marked distension of the bowel which was present. A lateral anastomosis by suture was made between the lower end of the ileum, 6 in. from its free end and the transverse colon. The abdominal wall was closed in one layer, the Paul's tube being brought out through the lower end of the wound. The drainage acted quite efficiently, and on the fourth day the bowels were opened naturally by the rectum. On the fifth day the



Cyst of the caecum in a child. A, vermiform appendix; B, window cut in the wall of the cyst; C, glass rod passing through the ileo-caecal valve.

abdominal wound gave way, and during the process of replacing the bowel which escaped the anastomosis was torn, and had to be resutured. The next day motions were passed by the rectum, and very little came through the enterostomy wound which was still retained. At the end of three weeks, owing to the septic condition of the anterior abdominal wall from constant faecal contamination, the marked wasting and downhill progress of the child, and its failure to take food, an attempt was made to close the faecal fistula. It remained closed for nine days, during which time the condition of the child improved, but it then broke down again. A fortnight later another attempt was made, but this also failed.

as did a further attempt made in October; the leakage, however, was very much smaller.

On December 10 an attack of acute intestinal obstruction supervened. The wound was freely opened up, and a dense band of fibrous tissue found to be tightly constricting a piece of intestine proximal to the site of the hole in the bowel. This was divided, and as far as possible the matted loops of intestine were separated from each other, the hole in the bowel carefully sutured, and the abdominal wall repaired in three layers. The original anastomosis was not seen. Since this time the child has made excellent progress, gaining in weight, taking food well, sleeping well, and has regular action of the bowels.

Except that the child is small, weighing only 15 lb. 8 oz., measuring only $28\frac{1}{2}$ in., and having only two teeth, he appears to be normal.

The specimen shows the condition found. It is a cyst in the wall of the cæcum, attached almost by a pedicle to the outer and posterior wall of the cæcum. It contained clear mucoid fluid, odourless, and not infected. The interior of the sac is not in any way connected with the lumen of the bowel. It has no connexion with the ileo-cæcal valve, but completely blocks its orifice. The appendix is natural and normally placed. The outer layer of the cyst wall is composed of a glandular tissue of bowel wall, lined by columnar-celled epithelium, the inner layer of flattened endothelial cells. The intervening tissue is composed of loose fibrous tissue and non-striped muscle.

DISCUSSION.

MR. GIRLING BALL added that the case was remarkable, firstly, on account of the recovery of a child, aged 3 months, after resection of a comparatively large portion of the bowel, especially as intestinal obstruction of some considerable degree was present. It was also surprising that the child survived several operations subsequently, in view of the conditions present. Secondly, the tumour and its pathology were of interest; the condition was an uncommon one, and its origin obscure; in some cases these cysts are described as being protrusions of one of the ileo-cæcal valves, as in the case of an intussusception, a portion of which becomes shut off, secondary cyst formation occurring; in this case the cyst bore no relation to the ileo-cæcal valve. Ziegler describes the tumours as being of teratoid origin. A third explanation is that a cyst is formed from some of the mucous glands lining the bowel; in this case, however, it was situated below or amongst the fibres of the muscle coats of the bowel.

Mr. PHILIP TURNER said that he was much interested in this case as he had shown a very similar one at a recent meeting of the Society. In his case the cyst was situated in the mesentery, in the angle between the colon and the termination of the ileum, and bulged into the intestine, causing obstruction at the ileo-cæcal valve. A diagnosis of intussusception was made, and the nature of the lump was only recognized when it was withdrawn from the abdominal cavity. He attempted to dissect out the cyst, but the wall of the latter was so incorporated with the intestine that this was impossible. The cyst was accordingly incised and drained, and the child recovered, but with a sinus discharging mucoid material. Though not occupying quite the same situation, the nature of the cyst was probably the same in both these cases.

Enlargement of the Mammary Gland in a Boy, aged $10\frac{1}{2}$ Years.

By L. E. BARRINGTON-WARD, F.R.C.S.

THE enlargement had been noticed for six months. There was no history of injury. The swelling had been tender at times. The left breast formed a swelling the size of an orange. It was slightly lobular and tender to touch. There were enlarged and painful glands in the axilla. The right breast was normal. The external genitals appeared normal, and the testes were descended. In character the boy had masculine tendencies well developed.

The exhibitor thought the case of sufficient rarity to merit demonstration. Mastitis in girls of any age was not uncommon; mastitis in boys was distinctly uncommon, especially if unilateral. The tenderness and the enlargement of the axillary glands suggested that this swelling was inflammatory, although an abnormal amount of mammary gland tissue must be present. With regard to treatment, he thought removal of the abnormal tissue was the right course to pursue, since the boy was about to go to a boarding-school and the deformity would be a constant reproach to him. It had shown no signs of disappearing during some months of expectant treatment and was becoming increasingly painful.

Dr. COCKAYNE said that unilateral enlargement of the breast usually occurred in association with testicular abnormality. One case was recorded in which the boy was a cryptorchid on the same side; in another boy approaching puberty the enlargement of the breast followed a severe blow to the testicle on the same side. In yet another case the left breast began to enlarge at the age of

13 years and increased in size till the eighteenth year, when it had reached the size of an average female breast. Though the penis, testicles, and pubic hair appeared normal, the individual was sexually abnormal. He had an almost hairless face, weak, high-pitched voice, and a narrow waist with a wide pelvis. Sexual desire occurred once a month, at which times the breast became firmer and occasionally secreted. Normal intercourse occurred, but sexual frigidity began at the early age of 33. For the first two years in this case it would have been impossible to detect any abnormality, and Mr. Barrington-Ward's case might come to resemble it later on. In girls a large percentage of the rare cases of unilateral atrophy of the mammary gland were associated with atrophy of the ovary on the same side. The importance of these cases was that they appear to prove that the connection by their secretions between the sexual glands and the mammary gland must be an indirect one through the nervous system and not a direct one through the blood-stream. He feared that the gland in this boy would remain large and cause much distress of mind if left alone.

Case of (?) Kernikterus associated with Choreiform Movements.

By LEONARD GUTHRIE, M.D.

E. B., AGED 1 year 7 months. Second surviving child of nine, five of whom were jaundiced and died within a few days or weeks of birth, and two were stillborn. The patient was also jaundiced at birth, and remained so for six weeks. She was brought to hospital on account of general "backwardness" and choreiform movements. She has never been able to talk, sit upright, or stand. Head: Brachycephalic, occiput steep and flat. Mental condition: Very defective; expression vacant. Takes languid notice of objects—e.g., watch—but puts all into her mouth. Says "Mum, mum," but utters no intelligible words. Is usually placid, but sometimes has "screaming fits." Locomotor system: Muscles generally weak and flabby, especially leg muscles. No spasticity, but some degree of hypotonia, especially at ankle-joints, though not more marked than in a child who has never been able to stand or walk. Tendon-jerks present and fairly active. Sits huddled up, and falls and rolls in all directions if unsupported. When held in erect position she advances her feet alternately in quick, short steps. Choreiform movements: She is said never to be still for a moment except when asleep. The head rolls or lolls in all directions. The body and extremities exhibit constant varying movements resembling those of chorea, but

much slower; they cannot be described as "clonic," "tetanoid," or athetoid. The term "choreo-athetoid" is perhaps most applicable. Tremors are absent, and also hypertonus and "rigidity."

Details of family history: Father and mother both healthy. Children: (1) Girl, now aged 16, said to be healthy. (2) Girl, stillborn at seven months, not known if jaundiced. (3) Boy, jaundiced, lived two weeks. (4) Boy, jaundiced, lived one week. (5) Boy, jaundice and profound anæmia, lived eight months. (6) Girl, jaundiced, lived four weeks. (7) Boy, jaundiced, lived three days. Post-mortem, February 1, 1909: Deeply jaundiced, liver extended $1\frac{1}{2}$ in. below ribs, no further details recorded; collapse of left lower lobe of lung, other organs seemed normal; brain not examined; umbilicus septic. (8) Present patient, jaundiced six weeks; choreiform movements and mental deficiency. (9) Miscarriage.

Remarks.—It is suggested that this is an example of survival from the form, usually fatal, of "icterus gravis neonatorum," described as "Kernikterus" by Beneke, Schmorl, Esch, and Pfannenstiel. The variety of the disease is familial, occurs in the earliest days of life, and is usually fatal in a week or two. "After death the basal central ganglia are found stained deeply yellow, whilst the rest of the brain is only faintly tinged; the yellow areas show necrosis of the ganglion cells, which is probably the cause of their ready absorption of bile pigment" (Garrod, Batten, and Thursfield, "Diseases of Children," 1912, p. 80). Nervous symptoms have not been described in such cases, probably because the patients have not lived long enough to exhibit them. But presuming that existence is maintained, the choreiform movements exhibited by this patient are such as might be attributed to the lesions in the basal ganglia observed in cases of "Kernikterus." Dr. Kinnier Wilson has drawn attention to the analogy between the anatomical lesions of the basal ganglia in "Kernikterus" and those of "progressive lenticular degeneration," associated with a peculiar form of cirrhosis of the liver. He suggests that, in the latter disease, toxins of hepatic origin have a selective action on the corpus striatum and thus produce the symptoms and condition of lenticular degeneration. The history of onset and course in the present case, and the character of the movements, are unlike those of progressive lenticular degeneration, but it is possible that it may be explained in a similar manner, although the precise site of the lesion may not be the lenticular nucleus itself. Here the choreo-athetoid movements suggest a thalamic or cortico-thalamic lesion.

DISCUSSION.

Dr. F. PARKES WEBER thought that in Germany the term "kernikterus" had as yet only been applied to the jaundiced grey matter as it had been found to occur at certain post-mortem examinations. Dr. Guthrie was now applying the term in reference to a case in which there was no jaundice at present, but in which it was supposed that "kernikterus" of the basal ganglia of the brain had been present soon after birth. He was therefore applying the term to the necrotic lesion which gave rise to the bile-staining (the imbibition of bile being a result of the necrotic change) instead of to the actual bile-stained appearance itself. If Dr. Guthrie's explanation of the choreiform movements in the child in question were correct (namely, that they were a result of the same kind of lesion in the basal ganglia as had been found present in fatal cases with "kernikterus"), the case would probably be the first one to show the late results after recovery from the initial symptoms.

Dr. GUTHRIE agreed with Dr. Weber that the term "kernikterus" was merely a description of pathological conditions found in certain cases of icterus neonatorum which as a rule ended fatally. He regarded the present case as an example of survival in such conditions. He did not suppose that the basal ganglion cells were now bile-stained, but that the degeneration which caused them to be so still persisted and accounted for the atheto-choreoid movements which the patient exhibited.

Multiple Subcutaneous Cysts in the Arms.

By EDMUND CAUTLEY, M.D.

THE child, aged 7 months, is the sixth of the family, only one being dead. He had fits at intervals from the age of 4 days to 8 weeks, and again last December. Apart from this he is reasonably healthy, though somewhat rachitic and ill nourished. "Lumps" are said to have been present at birth on the left and right arms and two on the back. They are described as having been purple and hard, and as having been called abscesses. They are said to have got smaller. No new ones have appeared and none have been noted in the other children. There are several nodules, varying in size from a millet-seed to a pea, in the left arm, mainly from the shoulder to the elbow. The skin seemed adherent to the larger ones, but the others are subcutaneous. Two minute ones were present at the bend of the right elbow; on removal these were found to contain clear fluid. The two said to have been present on the back have disappeared.

Case of (?) Serous Apoplexy.

By EDMUND CAUTLEY, M.D.

THIS boy was admitted on February 1, 1914, to the Belgrave Hospital for severe headache and drowsiness. He was aged nearly 7 years; the second of five children, all living; and had had measles and pertussis.

On January 26 he returned from school complaining of headache, due to hitting his head against a hot-water pipe. No bruise or bump was found. He went to bed early and slept, with short intervals, until 6 p.m. next day. After some tea he vomited. During January 28, after a very restless night, he kept to bed and slept at intervals. He vomited several times. On January 29 there was persistent headache, whining and restlessness, and occasional vomiting. These symptoms continued up to the day of admission. He had no fits, but he twitched at times, and had frequent attacks of "staring," with widely dilated pupils. During examination before admission he had general convulsions, with retracted head, slight opisthotonos, dilated pupils and staring eyes; the limbs extended and rigid, hands clenched, toes flexed; respiration grunting, and pulse-rate 50 to 60.

In bed he assumed the lateral decubitus, with his head a little drawn back, and legs flexed on the abdomen. He was rather irritable when touched, but there was no pain on flexing the head, and only a very slight tache cérébrale. The other physical signs were: Pulse-rate 60 and regular, respirations 10, temperature 99° F., retracted abdomen, and exaggerated knee-jerks. There were occasional attacks of staring and dilatation of the pupils. Optic neuritis was present in both eyes. The cerebrospinal fluid was under considerable pressure, clear, and contained many lymphocytes and a few polymorphonuclear cells.

Course: He was quite conscious next day, and had much less headache. On the third day the knee-jerks were less exaggerated, and five days later they were normal. On the fourth day Mr. Bishop Harman found 3D. of swelling in each eye. Since then recovery has been rapid. He was allowed up on the eighth day, but had to go back to bed again on the tenth day, for three days, because of the return of headache.

The diagnosis is doubtful. Possibly there was an effusion of fluid secondary to bruising of the brain from concussion, a condition of

external hydrocephalus or serous apoplexy. On the other hand, it is possible that there was mild basal meningitis, though there was no fever present during the boy's stay in hospital. Many diplococci were found in the cerebrospinal fluid, but as it was not examined until some days after it was withdrawn, they were probably due to contamination.

DISCUSSION.

Dr. CAUTLEY pointed out that the optic neuritis was a symptom somewhat unlikely to occur in external hydrocephalus of such a mild type, even though it might be due to an inflammation of the pia-arachnoid secondary to the injury. And he did not think there could have been any serious amount of internal hydrocephalus. On the other hand, the case was difficult of explanation if it were not accepted that there had been a certain amount of basal meningitis. A possible hypothesis was that of "mumps," although there was no evidence or history of the disease. A mild meningo-encephalitis, limited to the regions of the medulla and pons, was not very rare in mumps. It caused headache, optic neuritis, unilateral deafness, facial palsy, &c. Bradycardia was a sign, and an excess of lymphocytes was present in the cerebrospinal fluid. Now this boy had bradycardia, headache, optic neuritis and an excess of lymphocytes. Three nurses in his ward had recently developed mumps and the source of infection had not been discovered, but it almost certainly was some child in that ward. There was still 1D. of swelling in the left optic disk. In all other respects the boy was well.

Dr. R. MILLER suggested, in view of the cells in the cerebrospinal fluid and the later discovery of "diplococci," that the case might be a mild one of meningococcal meningitis. Quite recently a case had been under the care of one of his colleagues at Paddington Green with very mild meningeal symptoms, but in which the cerebrospinal fluid contained many cells and grew meningococci, although practically no organisms were visible in the film preparations of the fluid. He suggested that as this was the time of year for meningococcal meningitis, these cases were mild or abortive examples in a mild epidemic.

Subacute Nephritis with Ascites and Uræmia.

By EDMUND CAUTLEY, M.D.

CASES of this type are not common in children and this one presents several points of interest. The ascites was considerably more pronounced than the general œdema, and there was no evidence of pleural or pericardial effusion. There was comparatively little albumin and no blood in the urine when the boy was admitted, and yet he got progressively worse in spite of diet and diuretics. Neither paracentesis of the abdomen nor vapour baths, though combined with dry cupping and diuretics, relieved the congestion of the kidneys. There were no fatty casts in the urine. Uræmic fits developed and the child seemed moribund, but under vigorous treatment with vapour baths, subcutaneous injections of pilocarpine and diuretics, immediately after further paracentesis, he made a rapid recovery.

R. W., aged 9 years 2 months, was admitted to the Belgrave Hospital on November 10, 1913. He had scarlet fever at the age of 2 years, and pertussis, measles and varicella since. His tonsils and adenoids were removed one year ago. After feeling unwell for two days he was sent to the Hospital as a case of acute nephritis. There was a little œdema of the lower eyelids; 0·2 per cent. of albumin, numerous coarse and fine granular casts, and a few epithelial casts in the urine. The percentage of albumin increased to 0·7 on November 13, 2·5 on November 19, and 2·6 on November 21. Three days later it fell to 1·8, and œdema of the legs began. Up to November 27 the daily excretion of urine varied from 18 to 27 oz. After this it decreased to about 12 oz. daily during December. Ascites was noted on December 1. The percentage of urea was 1·9. Vomiting, about once daily, began on December 6 and continued up to December 22, when it ceased for five days, then recurring. During this month both the œdema and ascites increased, in spite of daily vapour baths from December 9 to 17. The percentage of albumin remained at 1·2 to 1·6, and of urea at about 1·8. On December 15, 5 pints of ascitic fluid were drawn off. Microscopical examination of the urine on December 31 showed numerous coarse and finely granular casts and cylindroids, with some renal epithelial cells and red blood cells.

On January 1 there was much ascites, œdema of the abdominal wall,

and scanty urine. Next day 96 oz. of slightly opalescent fluid were drawn off. More urine was then passed. On January 5 the boy vomited twice and had passed no urine for twenty-four hours. Next day vomiting was more frequent but there was no headache. Uræmic fits occurred in the afternoon for two minutes. The temperature rose to 102° F. and ranged between 101·6° and 103° F. for two days, then falling gradually, the attack of fever lasting for five days. On January 7 the boy took with difficulty, was apparently unconscious, passed urine in bed, but had no definite fits. Next day he had two fits and vomited once. At 5 p.m. 50 oz. of ascitic fluid were withdrawn, and a few hours later he was given a vapour bath and pilocarpine $\frac{1}{10}$ gr. On January 10 he had five fits. On January 11 he was rather better and more conscious. Pilocarpine in doses of $\frac{1}{3}$ gr. were given every two or three days up to January 26. On January 14 he ceased passing urine in bed. On January 18 the urine amounted to 30 oz., and next day the œdema had entirely disappeared and there was little ascites. From January 23 to 26 the daily excretion of urine averaged 50 oz. During the first week in February the daily excretion averaged 27 oz.; during the second week 21 oz., and the percentage of albumin fell to 0·3, while the boy gained over 2 lb. in weight. He is now taking full diet and still passes about 0·3 per cent. of albumin with some hyaline and granular casts. There are no retinal changes or signs of arterio-sclerosis. The pilocarpine injections were always followed by vomiting.

Congenital Hypertrophic Stenosis of the Pylorus.

By EDMUND CAUTLEY, M.D.

THIS boy, the third in the family, was born on December 13, 1913, at full time, and was apparently a normal healthy baby. He was breast-fed, and during the first ten days of life he regurgitated a little after each feed; then he "vomited everything." At the end of a month he was fed on milk and barley water, but the vomiting was worse; later on whey was tried. While breast-fed he would often retain several feeds, and once did not vomit for eleven hours.

On admission to the Belgrave Hospital for Children on February 14, he was obviously very much wasted, though weighing 7 lb. 7 oz. The

pylorus was palpable and visible peristalsis was very well marked. The stools were small, brownish, and contained some faecal matter. Mucus and retained food were washed out of the stomach. In spite of careful feeding he has lost ground and the peristalsis has become even more marked. If the stomach is washed out twice a day the vomiting is kept under control, but the wasting is more rapid. If it is omitted he gains weight for a day and then the vomiting increases in frequency and the loss of weight progresses.

The case is a typical one. On account of the hard, palpable pylorus, the increasing peristalsis, the progressive loss of weight, and the fact that there is little food passing through the pylorus, I propose to have the child operated on to-morrow morning. There is not much dilatation of the stomach, a fact favourable to successful post-operative treatment.

[*Note.*—Pyloroplasty was done next day. Eight hours later the child collapsed as the result of abdominal pain, and, though revived temporarily he died in three hours. The condition of the pylorus was characteristic, and after death no obvious cause could be found for the fatal issue.]

Case of So-called Congenital Hypertrophic Stenosis of the Pylorus.

By FREDERICK LANGMEAD, M.D.

THE girl, now aged 2 years 1 month, began to vomit on the eighth day of life. The ejected food was large in amount, and mixed with much "slime." The vomiting was often projectile in character. Constipation and wasting followed, and when admitted to the ward she weighed 6 lb. $2\frac{3}{4}$ oz. at the age of 7 weeks. When 4 weeks old the breast milk had been replaced by a patent food. There was one older healthy child.

When first seen in the out-patient department the characteristic gastric peristalsis was seen, and a pyloric tumour was felt. After admission to the ward well-marked peristalsis was often noted, but the tumour was not again felt. She was ordered 2-oz. feeds of peptonized milk every two hours. For the first week she did not improve, and vomited from one to three times daily. The stomach was then washed out twice daily, a good deal of residue and mucus being removed on each occasion. The vomiting improved from this time onwards, and

after a temporary loss of weight a steady gain followed. Washing out was reduced to once daily, three weeks later, and abandoned after another month. The peptonized milk was gradually replaced by unpeptonized. She made a complete recovery. To-day she is a healthy girl, and in the interval has taken a prize at a baby show.

The case is exhibited to show the good effects which may follow medical treatment for the condition, even when a pyloric tumour has been felt, and also the good state of nutrition which supervenes if such patients survive.

DISCUSSION.

Dr. CAUTLEY did not think this case could be justly regarded as a case of hypertrophy of the pylorus or even of pyloric spasm. The fact that the pylorus was only felt on one occasion was suggestive that it was not thickened. He pointed out that the most obvious diagnostic symptom was the large amount of mucus secreted by the stomach. He had drawn attention to the similarity between cases of mucous gastritis in infancy and pyloric obstruction in a paper read before the Section on April 26, 1912.¹ Peristalsis might be very marked and continue for several weeks, for the pylorus was obstructed by swollen mucous membrane and perhaps by plugs of mucus. He agreed with Dr. Pritchard that genuine cases of pyloric hypertrophy were not very common in infancy, and that the affection was often diagnosed when it did not really exist. Mere peristalsis and vomiting were insufficient facts to form a diagnosis on. Some of the cases were probably due to spasm. Although he regarded operative treatment as essential in typical cases, he thought there were milder degrees of hypertrophy in which the obstruction was insufficient to induce a fatal issue under medical treatment. On the other hand, in his experience, he had met with several cases in which food would pass through the pylorus, but not in sufficient quantities, so that the child died of marasmus. He regarded pyloroplasty as the ideal operation in the hands of an expert surgeon. If the child was extremely wasted and ill, dilatation (Loreta's operation) caused less shock and could be followed by pyloroplasty at a later date, should there be any recurrence of the obstruction.

Dr. R. MILLER, regarding the term "congenital" as the one most open to objection in the title of the disease, suggested that the substitution of "infantile" would meet the difficulties of many. Dr. Langmead had raised the question of the relationship of cured infantile cases to some instances of pyloric obstruction in later life. There was as yet no definite evidence to connect the two groups of cases. The only information on the point that he could give was that the gastric analyses in cured cases showed a normal condition, without any signs of the gastritis which was always present during the

¹ *Proceedings*, 1912, v, pp. 188-94.

period of symptoms. So far as this went, it agreed with the results of clinical experience, namely, that if one of these infants survived it did not suffer from any pyloric obstruction as a result. None of the cases whose gastric contents had been examined, however, were more than 5 years old.

Dr. LANGMEAD said, in reply, that he had called the condition "so-called" congenital hypertrophic stenosis of the pylorus because the three words "congenital," "hypertrophic" and "stenosis" were each regarded by some as being incorrectly applied to the disease. Certainly there was never more than a partial stenosis. He thought that if definite peristalsis of the gastric form and a palpable pyloric tumour were present, there was no need to suppose the presence of other conditions such as pyloric spasm or mucous gastritis. If with a characteristic history the well-marked peristalsis was obvious, he always diagnosed the case as one of hypertrophic pyloric stenosis, and this was invariably brought out if post-mortem evidence was obtainable. This meant that the signs of the disease were clearly defined, and were hardly capable of a wrong interpretation. He did not, of course, refer to indefinite peristalsis, which could only be felt, or the direction of which was undetermined, as in the case mentioned by Dr. Pritchard. Although such cases sometimes recovered under medical treatment, he was not opposed to surgical measures if medical treatment failed and the patient gradually lost weight, and he agreed that in Dr. Cautley's case surgical treatment was advisable. Dr. Cautley had referred to the collection of post-mortem specimens of the disease at Great Ormond Street Children's Hospital, where medical treatment was chiefly relied upon, but he (the speaker) would like to add that he had been responsible for the mounting of some of them, and four, at least, were preserved as specimens to show the various disasters which might follow surgical procedures. The girl after admission to the hospital was under the care of Dr. Batten, to whom any credit for her recovery was due.

Urticaria followed by Œdema in an Infant, aged 2 Months.

By JAMES BURNET, M.D.

URTICARIA, although commonly met with in young children, is comparatively rare in infants aged 2 months. The case I am about to record is, therefore, considered worthy of setting down in view of the fact that not only was the patient exceptionally young but also because of the subsequent œdema.

Some time ago I was asked to see a male infant aged 2 months on account of a rash which the mother said had developed quite suddenly. The parents were both healthy, but the mother appeared to be somewhat anæmic and extremely constipated. There was no

history of tuberculosis, syphilis, or rheumatism, or of cardiac or renal affections in the family. This was the first child. He was being breast-fed. There was some regurgitation after feeding and the stools were slightly green, but there was no diarrhœa. The infant looked perfectly normal in every respect. The only condition to be noted was the presence of a few red wheals which appeared on the forehead and sides of the scalp. These had developed a few hours before I saw the child. As I found the mother was nursing the baby very irregularly and was very constipated, I gave her the necessary directions. I also ordered a boro-calamine lotion to be applied to the affected parts. In two days the urticarial rash had entirely disappeared, and the infant appeared quite well. He was sleeping and taking the breast well. He had stopped vomiting and the stools were perfectly natural. Beyond the fact that the infant was so young to be thus affected, I attached little importance to the case and had quite forgotten about it when five days later I was again sent for.

The condition now presented was a somewhat serious one. The hands were swollen and resembled the appearance presented by a case of tetany, except for the absence of any abnormal position of the digits. The back, as far as the lumbar region, was very œdematous, as were also the chest and the upper part of the abdomen. The face was pale, the lips especially so. The œdematous parts were livid and hot to the touch. The pulse was feeble. The bowels were somewhat constipated, but there was no vomiting and the infant was passing plenty of urine. There was no affection of the heart. I found on inquiry that the mother was eating a great many eggs and had been drinking lemonade to excess. I advised her to have a mixed diet, to include a certain amount of fresh vegetables and fruit; and stopped the lemonade. For the infant I ordered small doses of potassium citrate and hydrargyrum cum creta.

For the next six days the œdema spread, to involve the whole of the trunk and all four extremities, as well as the scrotum and penis. At no time, however, was any part of the face affected. Its course was downwards, for the œdema began in the upper part of the trunk, and appeared last of all in the legs and feet. As it disappeared from one part it attacked another lower down, and always left behind considerable discoloration, like that of a bruise. Latterly there was some interference with micturition, so that the urine became somewhat scanty, but this very soon righted itself. No albumin was found in

a specimen of urine which was examined. So long as the œdema continued the parts were hot and irritable, while the lips were markedly pale, and the pulse feeble. As soon as the œdema disappeared the colour returned to the patient's face and the pulse assumed its normal healthy character.

The œdema, following so closely upon an attack of urticaria, at once suggested to my mind the possibility of this being an example of angio-neurotic œdema, although its widespread character in that case must needs be very exceptional. I have met with angio-neurotic œdema in children, but I am not aware that it has ever been recorded in the case of an infant aged 2 months. There was no heart or kidney trouble present, and consequently the cause of the œdema must be looked for in some other direction. It may have been due to some disorder of nutrition set up by the mother's somewhat extraordinary tastes in the way of food. This may in turn have led to some disturbance in the infant's vascular system which occasioned an attack of œdema.

The curious discoloration associated with the œdema is another point in favour of the condition being an angio-neurotic one. I have remarked an exactly similar appearance in every case of the kind I have seen, both in children and in adults. The sudden onset and favourable termination also leads me to such a diagnosis. At any rate, I consider the case is sufficiently interesting to place on record, as the subject of œdema, at least in children, apart from kidney and heart disease, is one which requires considerable elucidation. We all recognize the œdema of the face met with in older children suffering from digestive disturbances. This fact might also prove suggestive in connexion with the explanation of the case I have just been describing. I can only remark, in conclusion, that I have been unable to find an exactly similar record in the literature, although I have made a somewhat exhaustive search.

Dr. F. PARKES WEBER thought that the subsequent history would help to explain the case. If the urticaria and œdema were due to some temporary cause, there would probably be no future similar attacks of œdema. But, on the other hand, if the case were an early one of the type in which children (and sometimes adults) remain for many years subject to recurrent attacks of urticaria and "giant urticaria" (resembling angio-neurotic œdema) there would in all probability be further attacks of œdema occurring from time to time.

A Case for Diagnosis ; Pathological Condition of Hip.

By E. G. GAUNTLETT, F.R.C.S.

A BOY, aged 9 years, complaining of pain over the front of the left thigh for nine months. He has not been noticed to limp. No history of injury recently. On examination of the hip the movements of flexion and extension are free, whilst adduction, abduction, and rotation are markedly limited. There is no pain on movement or jarring the leg. The measurements of the legs are almost equal, and there is a little wasting of the muscles of the left thigh. The gluteal fold on the left side is less marked, and the greater trochanter is more prominent on the left side. The knee-jerks are brisker on the left side. Skiagraphy shows a marked erosion of the epiphysis of the upper end of the left femur, but without any rarefaction of the remainder of the neck.

Section for the Study of Disease in Children.

March 27, 1914.

Dr. LEONARD G. GUTHRIE, President of the Section, in the Chair.

Case of Ocular Torticollis.

By E. A. COCKAYNE, M.D.

THE patient, S. A., is a boy, aged $6\frac{1}{2}$ years. At the age of 2 months it was noticed by the mother's sister that he held his head to the left. The condition has persisted ever since. The boy also suffers from asthma. The attacks began at the age of 5 months, were very frequent at first, but have been less numerous lately. He had urticaria a few days after his last attack. In February, 1913, a surgeon was consulted on account of the torticollis and the boy's head was pulled over to the right by means of rubber tubes attached to a canvas headpiece above and to a band round the body below. He wore this intermittently for six months without benefit. The boy is well nourished but when awake always holds his head to the left. There is a compensatory spinal curvature of the cervico-dorsal region with convexity to the right. Facial asymmetry is well marked. In the position naturally assumed no squint is visible, but on straightening his head the right eye deviates upwards and inwards, strabismus deorsum vergens. The photographs show this very clearly.

Mr. William Lang kindly examined him and reported that he has binocular vision. He is too young for vision to be tested accurately. There is no astigmatism.

$$\begin{array}{cc} \text{Right} & \text{Left} \\ \begin{array}{c} \text{---} | \text{---} \\ +2.5 \\ +2.5 \end{array} & \begin{array}{c} \text{---} | \text{---} \\ +2.5 \\ +2.5 \end{array} \end{array}$$

Though diplopia is probably present when the head is straightened, the patient does not admit its existence. Ocular movements are good. No shortening or rigidity of the sternomastoid has occurred and the

head can be tilted over to the right voluntarily with ease. The condition is a very rare one. A similar case was shown by Mr. Sydney Stephenson at this Section in November, 1912.¹

DISCUSSION.

The PRESIDENT (Dr. Leonard G. Guthrie) said the case was a very interesting one and of a kind rarely seen. He asked Mr. Sydney Stephenson, who showed a similar case some years ago, whether there was any analogy between the holding of the head on one side in these cases and a similar carrying of the head frequently seen in young children with nystagmus.

Mr. SYDNEY STEPHENSON said he did not think the condition of ocular torticollis was extremely rare. Since he showed the instance before the Section to which reference had been made he had seen several others. He believed it was often overlooked. With regard to operative interference, there was, first, a difficulty in saying which muscle was at fault. Clearly, it was one of the depressors of the right eye, perhaps the superior oblique or the inferior rectus. One would wish to work out the case very carefully before caring to undertake advancement of the defective muscle; and it was not easy to identify the faulty muscle in a small child. He did not think the amount of deflection was very considerable. Most of his cases of the kind he had preferred to leave alone. He thought this inclination of the head preferable to the risk of something worse through operating on the ocular muscles. The origin of the condition was interesting. This case dated from the age of 2 months, and all the cases he had had dated from quite early life. He presumed that the compensatory inclination of the head would not be brought on unless the ocular paralysis did take place in very early life. Of course, adults with paralysis of an ocular muscle often assumed a characteristic carriage of the head, but in their case it was not permanent; the posture was only assumed when the subject wished to do so. This condition of ocular torticollis was more or less permanent, though the patient was able to straighten his head if told to do so. He was not prepared with an opinion as to the analogy between these cases and cases of nystagmus.

Congenital Deficiency of Vertebrae and Ribs.

By E. A. COCKAYNE, M.D.

A. K. is a well-nourished female infant, aged 9 months. Deformity of the chest was noticed by the child's aunt a month ago. There is a well-marked scoliosis of the dorsal region with convexity to the

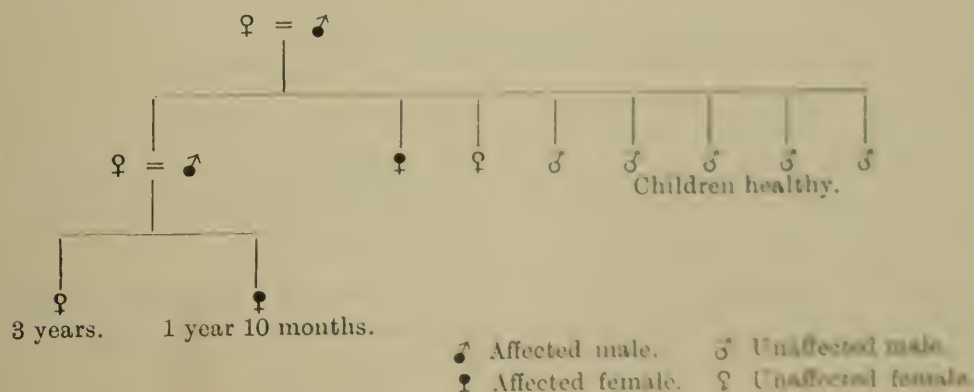
¹ S. Stephenson, *Proceedings*, 1913, vi, p. 17.

left. There is a marked depression in the right upper dorsal region behind, with a corresponding prominence on the front of the chest. There is also a prominence in the lower dorsal and upper lumbar region on the same side behind. The first, second, eleventh and twelfth dorsal vertebræ with their ribs appear to be normal. The third to the tenth vertebræ inclusive have a well-developed left half, but the right halves are separate from the left, are very small and irregular in shape, and, in some instances, are fused together. The ribs are given off very irregularly on the affected side. The third and fourth come from a small isolated mass, the fused right halves of the third and fourth dorsal vertebræ. The fifth and sixth ribs are absent. The ninth and tenth ribs have a common origin. The fourth, fifth, sixth and seventh dorsal half vertebræ of the left side have their bodies more or less split horizontally on their inner aspects.

Case of Hereditary Blue Sclerotics and Brittle Bones.

By E. A. COCKAYNE, M.D.

D. F., FEMALE child, aged 1 year 10 months. Has never walked. Deep blue sclerotics. Child is smaller than her sister was at same age. A skiagram shows less opacity of bones than normal. Father has blue sclerotics and broke both legs at the age of 16. Last July he broke his femur and several ribs by falling from his bicycle. His sister has blue sclerotics and has broken her ankle by slipping off the bottom step of a staircase. These two are smaller than any of their brothers and sisters; the father only weighs 7 st. 2 lb. The grandfather is a very small man, has blue sclerotics and has frequently broken his bones, the first fracture occurring when he was aged 15 or 16.



DISCUSSION.

Dr. COCKAYNE added that since the notes were printed the mother had given him particulars of a generation further back. The great-great-grandfather of the child was affected in the same way, with blue sclerotics and brittle bones. One of the sisters of the grandfather was similarly affected. All the people concerned had had numerous fractures of bones, and sprains at wrists or ankles. The persons were also very small in size. The father weighed a little over 7 st., and the grandfather's weight was considerably less than 8 st. Each affected person was the smallest member of the family. There seemed to be a deficiency of mesoblastic tissue throughout the body.

Dr. J. D. ROLLESTON said that the only other case of blue sclerotics and brittle bones that had been reported to the Section was one shown by himself in March, 1911.¹ The mother, maternal aunt, and maternal grandmother showed similar coloration of the sclerotics. The child was the subject of inherited syphilis. There was, of course, no ætiological connexion between inherited syphilis and blue sclerotics, but it so happened that the two conditions coexisted in that child. He presumed that there was no question of inherited syphilis in Dr. Cockayne's cases.

Mr. HAROLD BURROWS said that a year or two ago he published a family history of these cases, going back four generations, and a large number of persons were included, about 50 per cent. of all the persons having had blue sclerotics and brittle bones. The inquiry showed that there was a direct descent of the lesion. None of the parents who were free from the lesion had diseased children, and he gleaned from the mother that this was also a feature of the present case.

Dr. COCKAYNE replied that he inquired as to the hereditary syphilis, but there was no evidence of it in this case. It seemed to be always the case that an affected parent passed the peculiarity on to the child. The unaffected individuals always had normal children.

Case of Hirschsprung's Disease.

By C. MAX PAGE, M.S.

E. M., MALE, aged 5½ years.

Past history: He had always been constipated as a baby and till onset of symptoms of present disease. He is said to have had an operation for strangulated hernia when aged 2½ years.

History of present condition: Admitted to St. Thomas's Hospital on January 28, 1912, when aged 4 years, with faucial diphtheria. Two

¹ *Brit Journ. Child. Dis.*, 1911, viii, p. 202.

days after admission his bowels failed to act in spite of purgatives. On February 1, 1912, he showed signs of acute obstruction, the abdominal distension being very marked. On February 1 laparotomy was performed and a huge loop of hypertrophied pelvic colon found, accounting for most of the distension. The loop was tapped and then a colostomy was established just proximal to the hypertrophied area, which was limited to the pelvic colon. Symptoms were relieved and soon the bowels began to act normally as well as by colostomy. On March 30 the colostomy was closed by operation and the hypertrophied loop examined. On April 3 it was necessary to reopen the colostomy owing to recurrence of symptoms. Some local peritonitis was found. His condition gradually improved after this, the bowels usually acting normally, though occasionally the colostomy had to be dilated to relieve obstructive attacks. On May 20 the boy was discharged from hospital with a sinus only over the colostomy wound and the bowels acting daily after giving senna and a simple enema.

January, 1914: The wound has been sound for a year and the bowels have been regular with medicine. An X-ray shows an enormous loop of colon still present.

DISCUSSION.

Mr. MAX PAGE added that the boy had recovered from the symptoms caused at the time, and his bowels now acted regularly, and, apart from the possibility of hernia, he did not know whether it would not be better to leave him alone. The skiagram recently taken by Dr. Melville showed a large loop in the pelvic colon. These patients did sometimes live to 50 or 60 years of age, although they usually died from some complication of the condition.

Dr. THURSFIELD considered the case interesting, because it bore out what he believed to be the history of some of these cases—namely, that if one could keep them for a considerable period free from danger of obstruction, a degree of control over the dilated gut was recovered, so that they could go on, at any rate for some years, without anything further being needed. He had previously referred in the Section to a small boy who, for many months, was under treatment at St. Bartholomew's Hospital, and eventually became practically normal in the matter of his evacuations. For many months he had constant enemata; for a further period he had aperients, and finally was able to dispense with all aids, and had a daily motion. Though surgery had been extraordinarily successful in some of these cases, yet he thought there was a group of cases in children in which surgery could be avoided, and he thought even surgeons would not quarrel with physicians who said that in such a disease surgical intervention should be avoided as long as possible.

Dr. LANGMEAD said that perhaps Mr. Max Page might be interested to learn what happened to a case of his (the speaker's) after operative procedure. It was an eventuality which might equally happen in other cases. The patient was a child who had very great dilatation of the colon, apparently congenital. There were periods of constipation, succeeded by faecal incontinence. As it could not be controlled in the out-patient department the patient was admitted to hospital. He did not see the case again until some months afterwards, when the child returned to the out-patient department. He was still well nourished, and in good general health as before, and had obviously grown a good deal. In the meantime he had been operated upon, an ileo-sigmoidostomy, and afterwards removal of the colon, which was enormous, having been performed. But it had been found impossible to remove the lowest part of dilated colon. Despite that operation, there was at the time enormous distension of bowel, chiefly of small intestine. So far as he could determine, the child was no better after the operation than before it; he was still suffering from constipation alternating with diarrhoea, and now there was a largely dilated small intestine instead of colon. It had been regarded as a great success due to colectomy, but the question was whether it could be so accounted. An added feature was, that now the child brought up enormous quantities of flatus from the dilated small intestine.

Dr. J. T. LEON said he was interested in Mr. Page's remark that these cases sometimes lived on to 50 or 60 years of age, because a man aged 24 years was shown at the local meeting of the British Medical Association at Portsmouth as an instance of successful removal of the colon for constipation, and he suggested that it was a case of Hirschsprung's disease. He had had constipation as long as he could remember. The operation was very successful, the caecum and ascending colon being the only parts removed. Since the operation the patient had been able to dispense with aperients. It seemed to be a case of this disease which had survived to adult life and was cured by operation.

Mr. SIDNEY BOYD said he believed the chief danger in these cases of dilatation of the colon was ulceration, and consequent perforative peritonitis. With regard to the case referred to by Dr. Langmead, he supposed that, although the small intestines were dilated, there was much less chance of ulceration taking place in them than in a dilated colon. He asked whether rectal obstruction was present in Mr. Page's case. It was uncommon to find it, but he had a case in which there was a congenital stricture, and in spite of dilatation of the stricture, enemata, aperients, massage, &c., the patient got no better. He therefore removed part of the colon. He could not take away all the dilated portion, because the rectum also was involved. The boy made an excellent recovery, and though some faecal residue was present in the rectum the bowels now acted regularly and naturally.

Mr. CHAD WOODWARD said he understood that in this case the hypertrophy was limited to the colon. The case mentioned by Dr. Langmead bore out a point raised by Mr. Barrington Ward, that in the great majority of these cases the obstruction was not in the colon itself, but, as in Mr. Boyd's case, the hypertrophy also involved the rectum. Therefore, if the rectum were not dealt with the obstruction continued.

Mr. MAX PAGE replied that he was interested in the account of Dr. Langmead's case. In his own case it would have been impossible to excise the large loop of colon. He examined that carefully. The hypertrophy extended right down into the rectum. With regard to the enlargement which took place in Dr. Langmead's case after the operation, he suggested that the loop had grown again; that was possible. He had seen one case in which Mr. Makins removed a supposed hypertrophied sigmoid loop, and two years later the same woman turned up with recurrent obstruction. The abdomen was opened, and what was apparently another sigmoid loop was found. No doubt these hypertrophic colons had the power of growth longitudinally. In answer to Mr. Boyd, he did a sigmoidostomy, and from what he saw there was no stricture, though there may have been a limited retrograde intussusception. A small regular dose of medicine was all that was necessary to keep the musculature in order at present.

Two Cases of Achondroplasia.

By C. MAX PAGE, M.S.

Case I.—M., aged 10 months; first child. Typical signs. Slight lateral curve of spine. Treated on thyroid extract for last three months without any evident change.

Case II.—G. A., male, aged 11; first child. The mother has since had another boy who is normal. Typical case. Receiving thyroid extract.

DISCUSSION.

Mr. MAX PAGE said he preferred to name the cases chondro-dystrophia foetalis. He had given them thyroid extract, but he had been led to understand there was no justification for doing so. They should, no doubt, be left to grow up as best they might. He exhibited some slides, which had been taken by Dr. Melville.

The PRESIDENT remarked that Mr. Page did not indulge in speculations as to the cause of chondro-dystrophia foetalis, and he would be glad to know

whether the exhibitor had any views on that point. The latest suggestion he had read was that contained in a treatise by Jansen, of Leyden, who traced achondroplasia to pressure on the foetus by a too small amnion, or an amnion which was too much distended with fluid. The view was that the head and and tail end of the foetus were compressed by the smallness of the amniotic bag, and the result was to produce a kind of general ischæmia which dwarfed the extremities. All he (the speaker) could say as to that was, that although the condition of achondroplasia looked as if it might be produced in that way, there was no evidence that it was so. The strongest evidence against this condition, and others, being due to amniotic pressure, was that in some cases in which one found deficiencies and deformities which seemed to have been produced by pressure, one found them associated with polydactyly, which latter could not conceivably be produced by pressure, though the other deformities noticed might be. He thought achondroplasia should be regarded as a biological variation. It existed in Skye terriers and Dachshunds, and formed a valuable asset to them. He believed that, with care, one could produce a race of achondroplastic dwarfs, though perhaps it would not be any advantage to do so.

Mr. MAX PAGE replied that he understood most people a few years ago attributed the defective growth to a defect in the thyroid secretion; but it had since been shown that the thyroid secretion in these cases was normal. There was no evidence of syphilis. With regard to Jansen's theory, he thought if that were true there would not be such a generous growth of soft parts; indeed, amniotic pressure would affect soft parts more than bone.

The PRESIDENT, in further remark, said the idea that it was due to deficient thyroid secretion was probably based on the belief that certain calves were born achondroplastic, but they turned out to be merely cretinous calves.

Case of Spastic Diplegia.

By R. A. CHISOLM, M.D.

J. F., AGED 11 years, was admitted on February 1, 1914. Patient is one of twins. He was born by foot presentation, but the labour was otherwise normal. His general health has always been good. It was noticed that he did not sit up so soon as other children. He began to walk at the age of 2 years, but not well, and has never walked properly, though he has gradually improved in this respect. He has never had any fits, but has always had slight twitchings of the limbs and face.

He is a well-nourished boy. There is very marked spasticity of both arms, and the face is also somewhat affected. The legs are also somewhat spastic, but much less than the upper limbs, and he is able to walk fairly well, without any trace of scissor gait. There is a well-marked jaw-jerk, and the deep reflexes are all very brisk. The plantar reflex is of the extensor type. There is no disturbance of sensation, and no bladder or rectal trouble. Occasionally he shows slight twitching of the face and hands, but there is no true athetosis. There is no inco-ordination of the arms or legs, but the movements of the former are much limited by the spasticity. The optic disks show no change, and the Wassermann test (serum) is negative. There is no nystagmus, and Romberg's sign is absent. The patient is able to read a little, but the condition of his hands prevents him writing. He is somewhat backward for his age, but there is no obvious mental defect.

The case is shown as one of spastic diplegia (? due to meningeal hæmorrhage at birth), in which the arms are chiefly affected, while the usual mental involvement is absent.

Case of Multiple Exostoses.

By PHILIP TURNER, M.S.

E. F., AGED 13 years, attended the out-patients' department for a painful swelling at the inner end of the right clavicle. This proved to be an exostosis, the pain being probably due to some slight injury. Examination showed the presence of bony outgrowths near the extremities of most of the long bones. Of special interest are a very large growth from the outer surface of the left ilium and a small exostosis apparently growing from the lamina of one of the dorsal vertebrae. The bones of the hands and feet are not affected. The tumours give rise to no symptoms and cause no disability. The boy's father, a rather small but muscular man, aged about 35 years, also has multiple bony tumours which he says have been present since infancy. He also has a large exostosis growing from the outer surface of the left ilium, and two very large masses attached to the lower extremity of the left femur, as well as numerous smaller exostoses growing from other bones. In his case the bones of the hands and feet are normal, and the tumours cause no inconvenience. There is no history of similar tumours in any other members of the family.

DISCUSSION.

Dr. H. D. ROLLESTON mentioned the occurrence of multiple exostoses in a man aged 33 years and his son aged 7 years. The father had sciatica on the right side due to the pressure of an exostosis, which was evidently growing, and was therefore removed by Mr. Warrington Hayward. Before the wound healed a fungating spindle-celled sarcoma projected, and generalization killed the patient. This sarcomatous change in multiple exostoses was analogous to the malignant transformation which sometimes occurred in neurofibromatosis.

Mr. WOODWARD said he had seen similar cases in father and son. The father had about 180 separate tumours; and as some seven or eight in different parts of the body caused trouble, he removed them. One or two were also removed from the boy. They were found to be covered by a cap of cartilage, showing their capacity to go on growing until the time for ossification.

Dr. LANGMEAD said he remembered a family the members of which for three generations suffered from the same condition. The case of one of the family was figured in Pepper's "Surgical Pathology." That was when he was 9 years of age, and when he (the speaker) saw him he was aged about 40 years. He was taken into the ward because the tumours were still growing, and one in the axilla was hampering him and causing pressure pain. There was a cap of cartilage, and every evidence of a continuance of active growth. There were one son and two nephews of the patient he referred to who also had enchondromata.

Mr. SIDNEY BOYD said a case he showed at the Section two years ago illustrated the point mentioned by Dr. H. D. Rolleston. There were multiple exostoses, and one large tumour growing from the middle of the shaft of the radius, causing dislocation of the radius from the ulna. He accordingly removed it. There was much cartilage in that tumour, so he regarded it as an ossifying enchondroma. Here also there was a marked family history of the condition.

Case of Congenital Heart Disease.

By F. G. CROOKSHANK, M.D.

THE patient, a female, aged 14 years, is not known ever to have suffered any rheumatic manifestations. She is said, "ever since she was born," to have been short of breath, and to "turn a bad colour at times." She does not, however, apparently ever become cyanosed. Lately her dyspnoea on exertion has increased, and her general health

has been indifferent. She has complained of anginal pains down the left arm. Gerhardt's dullness can be made out, and the long systolic murmur heard over the præcordium, though more marked at the base, and there varying with respiration, can be traced at the back of the chest to the left of the vertebral column. The skiagram, taken at the Middlesex Hospital, shows the bulge on the left outline of the cardiac shadow that is characteristically seen when the ductus Botalli is patent, and the electro-cardiogram (for which I am greatly indebted to Dr. T. Lewis) proves the predominance of the right ventricle. The symptoms, physical signs, skiagram, and electro-cardiogram together appear to indicate the patency of a persistent ductus, with some pulmonary stenosis, and hypertrophy of the right ventricle.

Case of Hodgkin's Disease.

By J. T. LEON, M.D.

THE patient is a boy, aged $10\frac{1}{2}$ years. He was sent into the Royal Portsmouth Hospital in 1912, and was placed under a surgeon as a case of tuberculous adenitis. A mass of cervical glands were removed, and were seen not to have the appearance of tuberculous glands. The Clinical Research Association report on them stated "lymphadenoma." He was transferred to me in November, 1912. At that time only a few small shotty glands could be felt in the neck, and the spleen could not be felt. He had nocturnal incontinence, was anæmic, and had very bad teeth. The latter were partly removed soon after.

I lost sight of the boy till this month, when he was sent to me from the Tuberculosis Dispensary, where he had been attending some time for lumps in the neck. The mother states that the glands began to enlarge again about twelve months ago. The patient is now markedly anæmic. He has enlarged glands in the neck and left axilla. There is dullness on percussion, extending to nearly 1 in. outside the sternum, and to the nipple line. A hæmic bruit is heard over the pulmonary area. There is also dullness in the left lower axillary region (? splenic), reaching nearly to the posterior axillary line. The spleen can just be felt, and below it is a hard nodule. The blood examination shows 4,500,000 reds, 10,500 whites, and a colour index of 0.8. There is some poikilocytosis, and considerable variation in size of reds. In a stained film one or two myelocytes were seen. The liver does not appear to be enlarged.

DISCUSSION.

Dr. LEON said he brought the case specially to elicit information as to the possibility of treatment, especially as a mass was developing in the mediastinum. He believed arsenic was good for such a case, and he wondered whether X-ray applications also were of use. A girl, aged 15 years, was now attending his out-patient department who was able to take 45 minims of liquor arsenicalis a day, and she only kept well while taking it. The only effect of the drug otherwise was an arsenical complexion. When the medicine was stopped she got worse and the glands grew. He asked if salvarsan would be good for this present case. The leucocyte count was nearly normal, but there was a slight relative increase in the lymphocytes, which often happened in Hodgkin's disease. The latter was at one end of a series of cases of which the other end was occupied by lymphosarcoma. The occurrence of lymphocytosis in Hodgkin's disease was denied in Garrod, Batten, and Thursfield's "Diseases of Children."

Dr. COCKAYNE said he tried salvarsan in one case of lymphadenoma once during an attack of fever, and once in an afebrile interval. It was a very severe generalized case, and the salvarsan seemed to make no difference; the patient died.

Dr. CHARLES W. CHAPMAN desired to mention a case in an adult in peculiar circumstances. His breath got short, and he had very extensive effusion in the left pleura. An attempt was made to tap it. Two drops came away. The patient was under the care of Sir William Jenner, who said a large enough trocar had not been used. But a larger one only brought away two drops. In a few days the man died. Post mortem a large gland was found pressing on the bronchus and on the veins in the left chest. The bronchus was completely shut up by the pressure of the gland, which, by preventing re-inflation of the lung, accounted for the negative result of the tapping.

Dr. BOX said that a year or two ago he saw a case of lymphadenoma which had been treated in Paris by radium injection, and the result was that all the palpable tumours entirely disappeared. But the man developed an oscillating temperature, which continued for several months, and the case proved fatal. He believed no post-mortem examination was made.

Dr. H. D. ROLLESTON agreed with Dr. Cautley that the case was suitable for a trial of X-rays, which should be filtered through aluminium, so as to avoid damage to the skin. In some cases good had been done by the injection of arsenical preparations under the skin. In the early days of "606" a very severe case of generalized lymphadenoma, in which there was ascites and œdema of the legs and jaundice, received an injection of "606," and was temporarily much benefited. When there was a considerable mass of glands it was worth while to consider the advisability of making an incision and inserting a tube of radium.

Mr. WOODWARD said he understood that in America a specific bacillus had been found in the disease, and success had been obtained by vaccine treatment.

Case of Subcutaneous Injury to the Median Nerve at the Elbow.

By SIDNEY BOYD, M.S.

IN May, 1913, this patient, a boy, aged 8 years, fell off his bicycle, and sustained a fracture of the lower end of the right humerus. He was treated by a doctor, and the fracture united in good position. When he began to use the arm again it was found that he was unable to flex the thumb and index-finger. He came under my observation in October, 1913, and was found to have paralysis of the following muscles: Flexor carpi radialis, palmaris longus, flexor longus pollicis, flexor sublimis and flexor profundus tendons to the index-finger, and superficial muscles of the thenar eminence. There was loss of excitability to faradism in the affected muscles, but no polar reversal. There was no anæsthesia. The arm was put up on a metal splint with the affected muscles relaxed and regular massage instituted. Considerable recovery has ensued, and he can now fully flex the thumb and index-finger. There is still weakness of the palmaris longus and flexor carpi radialis, and some flattening of the thenar eminence.

Mr. BOYD had since ascertained that, at the time of the fracture, the arm had been put up with the hand on the opposite shoulder; there was no question of splint pressure in this case; it must have been contusion of the nerve at the time of the accident. Neither was there any question of involvement in callus. It must have been a partial lesion. The boy was recovering well under relaxation of the paralysed muscles by means of a suitable splint and massage, and complete recovery was probable.

Case of Congenital Torticollis.

By CHAD WOODWARD, F.R.C.S.

BREECH presentation. When the child was 5 weeks old the mother noticed a lump about the size of a walnut in the right side of the neck. Two weeks later she noticed that the head was beginning to deviate to the right. The lump is getting smaller.

DISCUSSION.

Mr. CHAD WOODWARD added that he thought it was scarcely torticollis yet, though it might be in a few years' time, and then he did not know that it could be termed congenital. A better name was "congenital sternomastoid tumour." Such swellings were sometimes hæmatomata, and that was the old view; and that they shrank and became fibrous, producing torticollis as the child grew up. But hæmatomata in other tendons produced lengthening, not shortening. He believed in the ischæmic view. When the head was flexed, an injection would not run into the sternomastoid branch of the superior thyroid artery. Therefore, if there were an injury during birth, and the muscle were deprived of oxygen sufficiently long to allow of an ischæmic condition arising, that would account for it; or if that branch were torn, thus depriving that portion of muscle of its blood supply. There was first degeneration of muscle-fibres, followed later by fibrosis, and as the child grew up the sternomastoid was relatively shorter. When seen at the age of this child, 3 months, he thought subsequent torticollis might be avoided by instructing the mother to exercise suitable care in manipulation.

The PRESIDENT said he was interested in Mr. Woodward's suggestion that these cases were due to ischæmia, and he would like to know how he explained the existence of a tumour on that supposition. One could understand atrophy and degeneration taking place, but not tumour.

Dr. WYARD said Mr. Page submitted to him a tumour which he had excised from the sternomastoid, which was causing some torticollis, and it consisted of old fibrous tissue causing degeneration of muscular fibres. There was no sign of round-celled infiltration about the tumour.

Mr. SIDNEY BOYD suggested that in these cases the hæmatoma was due to rupture of the artery, and the contraction of the muscle was not due to contraction of the hæmatoma, but to the ischæmia, as Mr. Woodward suggested.

Mr. CHAD WOODWARD replied that with this dead muscular tissue in the body, one could imagine a reaction around it, and there was œdematous round-celled infiltration eating up these muscle fibres, producing a spindle-shaped swelling.

Specimen of Cirrhotic Liver with Perihepatitis.

By J. W. CARR, M.D.

THE patient from whom this specimen was taken was a boy, aged $2\frac{1}{2}$ years, who was shown at the meeting of the Section on November 28, 1913, as "A Case of Enlargement of the Liver with Ascites." Afterwards he remained in much the same condition for a few weeks, but towards the end of December the ascites, which had been slowly increasing, disappeared quickly without any obvious reason, and at the same time there was copious diuresis. A few days later, however, it began steadily to re-accumulate, the boy developed a very irregular temperature, slowly got weaker, and died on January 23, 1914. Jaundice developed the day before death.

For the following description of the post-mortem appearances and of the microscopic changes in the liver I am indebted to Dr. Stanley Wyard, Pathologist to the Victoria Hospital for Children, Chelsea. Unfortunately there is nothing whatever to indicate the underlying cause of the lesions; the Wassermann reaction was negative on three occasions, and there was no evidence of syphilis of any kind. It is interesting to note that the changes in the omentum had resulted in a sort of natural Talma-Morison operation.

Post-mortem appearances: The peritoneal cavity contained a considerable quantity of deeply jaundiced fluid, and showed very many small hæmorrhages. The great omentum was rolled up and adherent to the anterior abdominal wall, just above and to the left of the umbilicus. It was almost devoid of fat, was fibrosed, and contained numerous large venules, which were continuous through the adhesions, with the vessels of the abdominal wall (a natural Talma-Morison operation). Liver enlarged, weight 22 oz.: surface smooth, dry, and almost entirely covered with an old organized exudate of lymph. Capsule thickened. On section the organ was very tough. Much excess of fibrous tissue about the intrahepatic vessels. The bile-duct, hepatic artery and portal vein were normal in appearance, and the easy passage of a probe showed them to be patent along their whole course. Spleen: weight, $2\frac{3}{4}$ oz.; marked perisplenitis, the capsule resembling that of the liver; splenic artery and vein completely patent. Stomach and intestines normal.

Microscopic changes in the liver: The liver presents, in the main, the features of an early multilobular fibrosis, but the appearances are very varied. There is universal perihepatitis, and Glisson's capsule everywhere shows a small cell infiltration, together with proliferation of young fibrous tissue cells. The portal vein is extremely congested. Pseudo-bile capillaries are a prominent feature in the fibrous tissue. The process has gone so far that the individual lobules are only distinguished with great difficulty. The main strands of fibrous tissue surround many, or parts of many, lobules; but, in addition, the individual liver cells are also separated and surrounded by new fibrous tissue. In some places this can be seen in excess about a central vein, and radiating outwards from it. In some parts the blood-vessels are extremely engorged, and the liver cells almost completely destroyed. In other places no such engorgement is apparent. Some of the glandular cells are normal in appearance, others show all gradations from slight swelling of the cytoplasm to complete disintegration. Some of the cells are laden with fine granules, collected chiefly about the nuclei. They are brownish-black, and are seen only in the neighbourhood of the muscular engorgements referred to above. The organ does not give the Prussian blue reaction. Fatty degeneration is not marked, but some cells scattered throughout show fine fat droplets in their cytoplasm, staining by scharlach r. and osmic acid. Nowhere do these droplets reach a large size, sufficient appreciably to distend the cell. These degenerated cells do not show any characteristic arrangement.

**Specimen of Tuberculous Kidney removed from a Child,
aged 3 Years.**

By SIDNEY BOYD, M.S.

THIS specimen was removed under spinal anæsthesia from a male child, aged 3 years. It shows advanced tuberculous changes with extensive cavitation and infiltration of pelvis and ureter. The case was admitted into the hospital, under a medical colleague, suffering from broncho-pneumonia and pyuria. The latter was believed to be due to a urinary infection with *Bacillus coli*, and at first the condition improved under urinary antiseptics. Later the left kidney enlarged, and tubercle bacilli were found in the urine. Cystoscopically, the left ureteric orifice

was inflamed, and the mucous membrane ulcerated around it. The right ureteric orifice was healthy, and efflux clear. The child made a good recovery from the operation.

Mr. SIDNEY BOYD added that it was unusual to find a tuberculous kidney in a child so young. A good recovery was made from the operation, but owing to the phthisis he went downhill and died six months after the operation. At the post-mortem the opposite kidney was seen to be quite healthy, which showed that in some cases in children the tuberculous of the kidney was unilateral, though more likely to be bilateral in children than in adults; in the latter, 60 per cent. of the cases were unilateral, even post mortem.

Specimen of Cirrhosis of the Liver.

By S. WYARD, M.D., and H. D. ROLLESTON, M.D.

THE patient was a girl, aged 6 years and 4 months. There were two other children quite healthy, and no history of alcoholism was obtained. She had been healthy until the age of 4 years, when she became pale and lost her appetite. In July, 1913, when under Dr. Jewesbury's care, the spleen came below the umbilicus, and the liver three finger-breadths below the costal margin; the red blood count was 6,800,000, the leucocytes 7,200 (polymorphonuclears 47, lymphocytes 32, large mononuclears 12 per cent.), and the Wassermann reaction was positive. On antisyphilitic treatment improvement occurred, and the spleen diminished in size until early in October, when diarrhoea appeared; on October 14 delirium followed by coma supervened. On October 15 she was comatose, covered with bruises, pulse 120. Kernig's sign present, plantar response flexor, no optic neuritis, liver 1 in. below costal margin, spleen 1 in. below the navel. Cerebrospinal fluid contained blood but was sterile. The blood showed 5,100,000 reds and 28,000 leucocytes, hæmoglobin 45 per cent., colour index 0.4; the Wassermann reaction was now negative. There was some ascites but no œdema of the feet. Urine dark in colour but did not contain albumin, blood, or diacetic acid. On October 17 she recovered consciousness, but diarrhoea returned, and a week later delirium and coma recurred, death supervening on October 29. While in the hospital the temperature varied between normal and 104° F., being 103° F. before death.

The liver weighed 20 oz. The right lobe was nodular on the surface and showed some adhesions, the surface of the left lobe being

smooth. On section both lobes showed cirrhosis, which was specially advanced in the left lobe. Microscopically the liver was extremely cirrhotic, islets of liver cells being surrounded by wide bands of fibrous tissue. The arrangement was multilobular, but considerable pericellular cirrhosis was also seen. The fibrous tissue was well formed and the process was apparently stationary. Very numerous pseudo-bile canaliculi were present. The liver cells for the most part did not show evidence of hyperplasia, though at one spot the appearance was suggestive, here the cells being large with rather large, faintly staining nuclei. All the cells have undergone extensive fatty degeneration, which affected even the cells of the pseudo-bile canaliculi. Spleen, 16 oz. There were no gross syphilitic lesions in the body; but previous pericellular cirrhosis may, by reducing the resistance of the organ, have facilitated the occurrence of portal cirrhosis.

Section for the Study of Disease in Children.

April 24, 1914.

Dr. LEONARD G. GUTHRIE, President of the Section, in the Chair.

Amyotonia Congenita.

By H. MORLEY FLETCHER, M.D.

MALE child, aged 3 years.

History: Full-term child, normal labour; weakness noticed since birth; feet and hands were flexed at birth. At the age of 3 weeks attended Hackney Road Infirmary for malposition of feet, which were put in splints, and was treated there for six months. Breast-fed for twelve months. Noticed to be abnormally weak when a few weeks old. Sat up at the age of 1 year; crawled at the age of 2 years; has never walked without support. Cannot feed himself. Mental development good; began to talk at the age of 7 months. Both parents alive and well. Three other children (girls) in family, one healthy. No similar complaint in any relation.

Present condition: Average-sized child with pallid, rather expressionless face. Intelligence quite good. Mouth-breather. Fundi oculorum normal. No obvious atrophy of muscles, but muscles of trunk and limbs are poorly developed and feeble. The child has considerable difficulty in raising himself into a sitting posture and still more so in standing; he can only maintain an erect posture momentarily. Crawls sitting on the buttocks. There is extreme flexibility of the wrists and ankle-joints, and of all joints of the fingers and toes. The fingers and toes can be hyperextended at all articulations to an extraordinary extent. The larger joints of the limbs show no undue mobility. Legs cannot be fully extended at knee-joints owing to slight contracture. Reflexes: Knee-jerks very difficult to obtain; plantar responses flexor; abdominal

brisk; cremasteric absent (?). Electrical reactions: All muscles respond to faradic current, but weakly, especially those of the back; the muscles of the extremities react to the galvanic current, not very briskly, but not with the sluggishness of the reaction of degeneration; the trunk muscles respond feebly to the galvanic current. Wassermann reaction negative.

Arthritis of the Left Shoulder-joint occurring subsequently to Pulmonary Disease.

By A. E. MORTIMER WOOLF, F.R.C.S.

THE patient, a boy, aged 8 years, attended Dr. Bellingham Smith's Out-patients' Department at the Queen's Hospital for Children in April, 1911. According to the medical notes at the time, he was complaining of severe cough, and inability to walk. Two months previously he had had enteric fever, and three weeks previously suffered from influenza, as evidenced by pyrexia, cough, and abdominal pain. At this time he was passing very offensive brown urine "like blood." On examination the right side of the chest was dull, flattened, and there was no air entry. The heart was displaced to the right, and the temperature was 101° F. He was admitted to the medical wards with the diagnosis of either pulmonary tuberculosis or fibroid contraction of the lung after pneumonia.

He improved greatly and remained under medical treatment, as a case of fibroid lung of tuberculous origin, up to July, 1913, when he was transferred to the Surgical Out-patients, under the care of Mr. Stephen Fenwick, to whom I am indebted for permission to show the case.

For four weeks he had complained of pain in the left shoulder-joint. The mother had noticed wasting of the shoulder for three weeks. On examination: There was marked limitation of movement, the very small range of excursion possible being due to humerus and scapula moving in one piece. There was considerable pain, together with slight wasting of the deltoid. At no time had there been any swelling of the joint. Dr. Bellingham Smith reported that there were then no signs of active tuberculosis in the lungs.

A skiagram of the thorax taken in August, 1913, showed numerous shadows, which were considered to be due to pulmonary disease, and to calcareous glands. A skiagram of the shoulder taken on the same date shows marked caries of the head of the humerus, chiefly on the outer side.

The treatment adopted was the application of a poroplastic splint with a shoulder cap, and an axillary U-piece, fixed in such a position as to keep the arm slightly abducted. It was necessary later to strengthen the thoracic, arm and axillary U-pieces of the splint by a steel band. He was put on doses of tuberculin (T.R.) by mouth, beginning with a $\frac{1}{1000}$ mg., and gradually increasing, every fortnight, until $\frac{1}{10}$ mg. is now being taken. The splint has been worn for nine months. There has been no pain since its application, and the joint can now be abducted 40° , and there is fair rotation.

An X-ray of the shoulder-joint taken in January shows almost complete healing. Moreover, Dr. Bellingham Smith reports that the pulmonary condition has entirely cleared up.

DISCUSSION.

Dr. MILNER BURGESS suggested the lesion was of typhoidal origin. He had an apparently similar case recently in an adult.

Mr. PHILIP TURNER regarded the case as one of arthritis of the shoulder-joint, of tuberculous nature. The history he considered characteristic of that condition, the first symptoms noticed being wasting and stiffness, which subsequently increased, and without much pain. After that the shoulder seemed to have been ankylosed. The skiagram shown in connexion with the case was also suggestive of it being tuberculous.

Dr. MIDELTON agreed with the diagnosis of tuberculous shoulder. For a long time he had considered that in a large majority of cases of chronic arthritis, including what was known as rheumatoid arthritis, there was a strong tuberculous element. It was not always easy to say that one was dealing with tubercle, but in some cases there was strong ground for suspicion. A view he had long held was that the joints acted as receptacles or lodging places for toxins, and possibly germs, and that, when joints were attacked, other tissues in the neighbourhood did not suffer so much. When tubercle affected joints the disease ran a much longer course than when joints were free. Some believed the joints had some special elaborating faculty. He did not think the present case was acute enough for it to be pneumococcal; in that disease the joint, as a rule, had to be opened quickly. He was interested to hear that swelling was a feature of typhoidal infection of joints, and it was a useful diagnostic point.

Dr. HUGH THURSFIELD said he hesitated to intrude into the province of the surgeon in this matter, but he had a strong feeling that the diagnosis of tubercle was made a good deal too freely: because, if one pursued bacteriological examinations into acute and chronic joint conditions, one was amazed at the variety of organisms found. In hospital cases he had known instances

of practically every one of the common pathogenic organisms being the cause of acute or chronic joint trouble. He did not think one could, either clinically or radiographically, diagnose a tuberculous joint from one due to other organisms, and he believed the bacteriological was the only sure method of differentiating tuberculous, pneumococcal, gonococcal, meningococcal, typhoidal, para-typhoidal, *Bacillus coli*, and other infections. In the present case he would be content with the recognition that the boy had chronic arthritis, and would decline to attach a more definite label to it. And as the patient appeared to have recovered, he certainly would not attempt to achieve the impossible.

Pneumonia and Encephalitis Cerebelli.

By LEONARD G. GUTHRIE, M.D.

W. H., AGED 2½ years, was admitted to Paddington Green Hospital, under the care of Dr. Sutherland, on January 6, 1914, suffering from convulsions and left basic pneumonia.

History: For two days he had been languid, feverish, coughing a great deal, and calling out in his sleep. At 7 a.m. on January 6 he was brought to hospital in a fit of generalized convulsions.

On admission: Well-nourished child; herpes on upper lip; temperature 103·8° F., respiration 36, pulse 132. Definite pneumonic consolidation at left base. One severe and several minor attacks of generalized convulsions, with conjugate deviation of eyes to either side, occurred during the two hours following admission, after which the fits ceased; but the child remained in an irritable, semi-conscious condition, resembling that of advanced meningitis, for upwards of a fortnight. Well-marked tache cérébrale; occasional twitching and rigidity of limbs, but no retraction of head; respirations cyclical, irregular, deep, or shallow at times; incontinence of sphincters. Optic disks and ears normal.

On lumbar puncture fluid escaped slowly under some pressure; it was clear, formed no clot, contained no excess of albumin nor of cells, but sugar rather in excess; no organisms found in films.

The temperature fell by lysis, became normal on January 17, and remained so. The signs of pneumonia gradually cleared up; but for a week or more the child seemed imbecile, extremely irritable, with a wild or vacant look, speechless, dribbling, unable to hold his head up or to sit upright. There was no squint, pupils and disks were normal, no nystagmus. Examination of cerebrospinal fluid again negative. Intelligence slowly improved, he smiled, took notice, became less

irritable, though still speechless, and incontinent. Signs of cerebellar insufficiency were now apparent. Inability to stand or maintain equilibrium when sitting, general weakness and hypotonia of all muscles of limbs, marked intention tremors and ataxy on voluntary movements, especially of right upper extremity. Knee-jerks exaggerated, plantar responses flexor, abdominal reflexes sluggish.

He was discharged after being seventy-two days in hospital, slowly improving though still unable to stand, tremulous and ataxic. Speech had not returned, but power over sphincters had been regained.

Present condition: Quite intelligent, hardly any ataxy of hands, can feed himself and play with toys, can sit up but cannot stand without support, and still swaying to and fro or from side to side. He is still unable to speak but makes effort to do so.

Remarks.—The most probable diagnosis in this case is encephalitis rather than any form of meningitis. Most cases of polio-encephalitis have been associated with some acute infection, usually measles or some other exanthem. Here the association was with pneumonia, but it is impossible to say whether the encephalitis was due to pneumococcal or some other infection. Although the symptoms eventually pointed to cerebellar affection, they certainly suggested a much more widely spread disturbance at first, and we are not justified in regarding them as solely due to cerebellar encephalitis. But as in poliomyelitis so in polio-encephalitis, the early symptoms are always more widely spread than can be accounted for by the ultimate site of the lesion. The absence of head retraction and opisthotonus, and also the normal condition of the cerebrospinal fluid, would seem to exclude posterior basic or other form of meningitis. Had the symptoms been due to meningitis interna serosa (internal hydrocephalus), optic neuritis, headache and vomiting would probably have been present. Moreover, the cerebellar symptoms in internal hydrocephalus are caused by pressure downwards of the pons, cerebellum and its peduncles into the foramen magnum. Their long persistence would imply that internal hydrocephalus was still present, but of this there is no evidence.

DISCUSSION.

Dr. SUTHERLAND said his views on the case were somewhat like those just expressed by the President. The patient came into hospital suffering from pneumonia, with cerebral symptoms, which were not regarded as very unusual. When lumbar puncture was done the fluid was found to be under considerable pressure, but no organisms were grown from it. He thought the fluid was of

the type associated with serous meningitis. After the acute symptoms passed off the mental symptoms and the general paresis were so striking, and the recovery was so slow, that a diagnosis of acute encephalitis was made. The interest to him was its association with the pneumococcus. The white cell count was 45,000—exceptionally high even for pneumonia in a child. Considering the protracted nature of the illness, he doubted the prospect of a complete recovery, though further improvement would probably ensue.

Dr. COCKAYNE, speaking of the association of pneumonia and polio-encephalitis, said that one of the cases which Dr. L. G. Parsons described in his paper was associated with pneumonia. The child was under a year old, and had persistent retraction of the head and a curious tremor, but no optic neuritis. Lumbar puncture produced clear fluid, from which nothing in the shape of organisms was grown. At the time it was regarded as an accidental association.

Dr. MILLER, referring to the case spoken of by Dr. Cockayne, said Dr. Parsons and he had received the tradition that polio-encephalitis (of the type allied to polio-myelitis) nearly always followed some acute infection or exanthem; but in one year only one case out of twenty-six cases of polio-myelitis had had an exanthem or fever in the preceding three months. The same was true in a series which he took over another year. He took it that in the present case the name encephalitis was given on the supposition that there was a destructive lesion in the cerebellum due to a local infection. Otherwise it was possible to explain the whole condition as due merely to profound toxic changes in the brain.

Dr. MIDELTON asked why, in inquiring as to infectious disease in the history of the case, any limit of time should be placed restricting it to a few months. The causal germs might lie latent for a long time.

The PRESIDENT (Dr. Guthrie) replied that he was surprised to hear the remark of Dr. Miller as to the rarity of association of encephalitis with exanthemata. Several of the cases he had himself come across had been associated with measles or some other exanthem. He did not contend that there was a destructive lesion of the cerebellum; he regarded it as a case of toxic interference with the activity of the cerebellar centres, and he said that, because in the great majority of cases perfect recovery ensued in time. For that reason his prognosis in this case was much more cheerful than that expressed by Dr. Sutherland. He believed that in a year's time the child would be walking about well, and he would not be surprised to hear that the speech had returned before that date; the child was already making prodigious efforts to articulate.

Case of Mongolian Blue Spots.

By E. A. COCKAYNE, M.D.

L. C., AGED 11 months. Father and mother both Jews. No similar markings noticed in family. The blue spots were noticed soon after birth. The spots, when first seen at the age of 9 weeks, were of a clear slaty-blue colour, unaltered by pressure. There were three very large ones on the lower part of the back, one extending into the left gluteal fold, and one on the left flank, two on the right shoulder, and one just below the left deltoid.

DISCUSSION.

Dr. COCKAYNE added that the spots had faded much since he first saw the case; they were on the back, shoulders, and flank. The question was as to what the spots meant; they occurred in other races than true Mongolians—in Malays, Polynesians, and Negroes, in most American native races, more rarely in Semitic and Caucasian white races. It was probably an atavistic phenomenon, and raised the point as to whether mankind had at one time blue skins. He believed all blue spots were on dorsal surfaces of limbs and trunk, or on the face, and presumably in the past the colour was confined to this area.

Dr. ERIC BELLINGHAM SMITH supported the view that this peculiarity did not belong solely to Mongolian races. In one family which he knew each child had blue spots above the buttocks. The mother of those children described her grandmother as "having been a Spanish lady," who resided in the West Indies. The appearance of the children themselves suggests a negroid descent.

Cubitus Varus following Fracture of the Lower End of the Humerus.

By PHILIP TURNER, M.S.

F. B., AGED 13 years, was admitted to hospital in January, 1913, for deformity of the left elbow. Six and a half years before she had a fracture of the lower end of the humerus as the result of a fall. The fracture appears to have been treated with an internal angular splint. The deformity followed the fracture, and for the past two years the

elbow has been so painful that it could scarcely be used. On admission full flexion was possible, but on straightening the arm it became markedly adducted at the elbow owing to the alteration of the "carrying angle," and could be over-extended. Pronation and supination were normal. All movements caused much pain. At the operation the humerus was divided transversely immediately above the condyles, and the arm put up in a position of full flexion. Massage and passive movements were started at the end of two weeks. The axis of the forearm now bears practically the normal relation to that of the arm and the joint can be freely moved without causing pain. Full extension is, however, impossible. Functionally the arm has been greatly improved by the operation.

Syphilitic Cirrhosis of the Liver ; Ascites ; Talma-Morison Operation ; Arthritis of the Knee.

By PHILIP TURNER, M.S.

J. M., AGED 7 years, was admitted to hospital on December 30, 1913, under Sir Cooper Perry, for hæmatemesis and melæna and abdominal distension. He had previously been an in-patient for anæmia and enlargement of the liver and the spleen. On admission he was thin and anæmic, the liver and the spleen were slightly enlarged, and the glands in the neck, axillæ and groins were palpable. Examination of the blood showed 3,108,000 red cells, 6,560 whites, and hæmoglobin 65 per cent. A differential count showed polymorphonuclears 60 per cent., large lymphocytes 8.5 per cent., small lymphocytes 26.5 per cent., eosinophiles 2 per cent., hyalines 3 per cent., basophiles 0.5 per cent. The abdomen was distended, and as this increased he was tapped on January 12, when 1 pint of yellow fluid, which proved to be sterile on cultivation, was drawn off. Distended veins were present in the subcutaneous tissues of the abdominal wall, and the blood in these flowed from below upwards. A Wassermann reaction was negative. A diagnosis of syphilitic cirrhosis of the liver was made. As the fluid in the abdomen quickly re-collected operation was decided upon. The abdomen was opened above the umbilicus, and the liver was found to be hard and nodular. The omentum, which contained many dilated veins, was drawn into the wound, and was then spread out and fixed by a number of sutures in the space between the rectus muscle and the posterior

layer of its sheath. Many dilated veins were also noticed in this space. The peritoneal cavity was drained by a small glass tube. After the operation there was some irregular pyrexia, the temperature on one occasion rising to 104° F. The drain was removed at the end of a week; both wounds healed quickly. The abdomen then again became very distended, and on February 6 he was again tapped and over 7 pints of fluid were withdrawn. There was again some collection of fluid, but the distension soon became less, and no further tapping has been called for. The general condition also improved.

On February 27 the right knee became swollen and painful. Next day this was aspirated, and 25 c.c. of cloudy yellowish fluid were drawn off. When examined bacteriologically by Dr. Eyre this was found to contain a Gram-negative diplococcus closely resembling the gonococcus. The knee was again tapped later, and a similar organism again found. A cultivation from the urethra showed no gonococci, and no history of any gonococcal infection could be obtained. The knee was put in a plaster splint, and has improved. The abdomen, though still rather distended, is much less full than it was. The general condition of the patient is much more satisfactory. The superficial veins of the abdominal wall are much less dilated.

DISCUSSION.

Mr. SIDNEY BOYD said he would like to know why Mr. Turner preferred to do omentopexy rather than splenectomy in this case; it seemed to him this would have been more likely to attack the disease radically. In the face of the authority quoted by Mr. Turner he did not quite like to cast doubt on the diagnosis of inherited syphilis, but the Wassermann reaction was negative, and he gathered that there was no other sign of syphilis. Recently he had a case which seemed to throw some light on the present one. It was that of a young woman, aged 24 years, who had ascites and cirrhosis of the liver, and an enlarged spleen. He removed her spleen, and following that operation her ascites cleared up. That was four or five months ago, and she had enjoyed good health since. From the spleen a culture was grown of a thick bacillus, which Dr. Gibson, of Oxford, believed to be the structure he had described in other spleens as a streptothrix. This present case seemed to him to be probably one of splenomegaly due to infection by some micro-organism, the liver condition being secondary.

Mr. TURNER replied that the question of removal of the spleen was discussed, but his medical colleagues were against that operation. At the time of the operation the trouble seemed to be essentially in the liver, which

was very irregular, hard and nodular on the surface, and there was much perihepatitis. There was some difficulty about the diagnosis, and he did not consider himself altogether responsible for it; but the diagnosis having been made, he felt that he was to a large extent guided by it in his procedure. The abdominal girth at the umbilicus was now 3 in. less than just before the operation.

Case of Enlargement of the Spleen.

By R. A. CHISOLM, M.D., and E. BELLINGHAM SMITH, M.D.

E. H., A BOY, aged 8 years, first attended the Out-patients' Department at the Queen's Hospital on November 15, 1911, for "cough, wasting, and general debility," following pneumonia six months previously. At this date the child was noted as being exceedingly under-sized and as having some distension of the abdomen, but with no evidence of free fluid or glandular enlargement. Seven months later his condition was still unsatisfactory, and an examination at this date showed an enlargement of the spleen, extending about two finger-breadths below the costal margin, and an almost corresponding enlargement of the liver. Until November, 1913, the enlargement of the liver and spleen remained about stationary; since that date there seems to have been some progressive enlargement of the spleen, while the liver has decreased in size, so that it is now no longer palpable. The vertical area of dullness of the spleen has in the last six months increased from $4\frac{1}{2}$ to $6\frac{1}{4}$ in. There has never been any jaundice, but a month ago the boy is said to have vomited a small quantity of blood. The blood count on March 3, 1914, gave: Hæmoglobin, 72 per cent.; red blood corpuscles, 4,800,000; white blood corpuscles, 5,600. Differential count: Polymorphonuclears, 56.5 per cent.; lymphocytes, 40.5 per cent.; eosinophiles, 2 per cent.; basophiles, 1 per cent. A second count on April 9 gave an almost identical result. The Wassermann reaction is positive. Previous to the birth of this child the mother lost four successive infants with wasting.

The question that arises is as to whether this is a case of splenic enlargement associated with cirrhotic changes in the liver, or whether it is possibly a case of splenomegaly dependent on congenital syphilis. The diagnosis is of importance from the point of view of treatment—namely, whether the spleen should be removed or whether only an active course of antisymphilitic treatment should be undertaken.

DISCUSSION.

Dr. BELLINGHAM SMITH said that removal of the spleen should not be undertaken without careful consideration, because it was not altogether a non-fatal operation. A surgical colleague of his had operated for him in a case of splenomegaly, associated with cirrhosis, and removed the spleen, and the child died in forty hours from a curious condition which resembled double pneumonia; the streptothrix which Mr. Boyd mentioned was found to be present in the blood and peritoneal cavity. It seemed as if the infection in this case was due to the letting loose of the streptothrix throughout the body as the result of the operation. If this present patient was only syphilitic, the operation was not likely to do much good.

Mr. SIDNEY BOYD said Dr. Chisolm intended to try antisyphilitic treatment first, and if that did not succeed he would consider removal of the spleen. That was his own feeling in the matter and he would try salvarsan first. The case belonged to the class which rapidly went down hill if they did not respond to antisyphilitic treatment, and died in a few years. If splenectomy seemed advisable it should be done early, because that had a great effect on the mortality. The success of splenectomy depended largely on the absence of adhesions of the spleen to the diaphragm and neighbouring organs. If these adhesions had formed when the operation was undertaken the operation was very difficult and was much more liable to be fatal.

Partial Paralysis of the Abdominal Muscles due to Infantile Paralysis.

By E. BELLINGHAM SMITH, M.D.

F. D., A BOY, aged 7 years, was brought to hospital on October 1, 1913, for "paralysis." The history states that on August 12, 1913, the child in question was taken suddenly ill with sickness, pains all over, and feverishness. The pain lasted about fourteen days, and it was then noticed that the boy had lost the use of both arms and both legs, was unable to turn over, sit up, or even raise his head from the pillow. On examination on October 1 these features were still present, and in addition it was noticed that respiration was almost entirely dependent on diaphragmatic action, the intercostals, and to a large degree the accessory muscles of respiration, being paralysed. Now, at a date seven and a half months after the onset of the disease, there appears to be a very slight paralysis of the extensor muscles of the thigh and leg on

both sides, and he is able to walk with assistance; the difficulty in walking seems to be dependent rather on the weakness of the trunk muscles than on any disability due to the affection of the legs. The movements of the right arm are perfect, while those of the left are only limited by paralysis of the deltoid on that side. When we come to the trunk, however, we find that there is a distinct prominence or ballooning of the whole of the upper third of the abdominal wall, which is accentuated on coughing or on efforts to rise from the prone position, and is apparently dependent on a bilateral symmetrical paresis of the muscular tissues in this area. The reflexes over the upper one-third are absent, but are present in the lower two-thirds. In addition to this deformity, the lower part of the chest shows a deep, transverse groove, resembling Harrison's sulcus, while the lower costal margin is sharply everted. This deformity would appear to have been produced by the unopposed and excessive action of the diaphragm. The chest still moves but very little during expiration and inspiration, and there is evident intercostal paralysis. There is no deformity of the spine at present and the muscles of the neck seem to have entirely recovered.

Dr. WILLIAM EWART mentioned the disadvantage of having the patient lying exclusively on the back in cases where the thoracic mechanism was disabled. Any disease would be more rapidly cured if pulmonary ventilation and the heart's action were kept at their best. The present case, upon which he did not presume to offer any criticism, might be used to illustrate, as a typical case of exclusively diaphragmatic respiration, a general principle which was worth remembering in various other conditions better suited than this for its application. Without the help of the abdominal muscles, which in this case were paralysed and atonic, the diaphragm was unable to expand the posterior base thoroughly. Some substitute was required for their expiratory work, and some mechanical support to replace their tone. If the patient could with safety be placed on the front instead of on the back, two results would be gained: (1) the abdominal wall, which was needing support, would get it; and (2) the great respiratory reserve at the posterior bases would be called into full play. It was true that in a case such as this the dorsal ribs would not work as in a healthy person, but in that posture there would not be that impairment of the inspiratory action of the diaphragm which must arise from a complete loss of the expiratory forces of the abdomen. To carry out that indication he had devised, some years ago, and had used in various diseases, and especially in rickets, a prone couch for infants and small children, and also a more elaborate one for convalescent adults. The prone couch was specially indicated in phthisis. Hitherto it had been the custom in sanatoria to keep the patients lying on their posterior bases, and their stomachs inflated with milk. What was wanted was to give the lungs every opportunity for complete expansion. Lying on the back was not helpful towards their cure.

Benzol in the Treatment of Lymphatic Leukæmia.

By J. N. MACBEAN ROSS, M.B.

THIS case was shown before the Section on January 23 of this year.¹ At that time the patient had only been under observation for about a month, so the results, though striking and suggestive, were not absolutely conclusive. He has now been under observation for four months, and Dr. Rolleston has asked me to report the further progress of the case.

The history was briefly as follows: A boy, aged 6½ years, was admitted on December 11, 1913, to the Victoria Hospital for Children suffering from general debility and swelling in the neck of eight months' duration. Previous health: He had had measles twice, the second attack occurring eight months before admission and being followed by pneumonia. Otherwise he had been an exceedingly healthy child. Family history contained nothing of importance. History of present illness: Eight months ago, when he was recovering from his second attack of measles, his mother noticed several lumps in his neck; these got progressively larger but were never painful.

Condition on admission: Patient was a pale, anæmic, constipated, listless child, who looked obviously very ill. Lymphatic glands: There were numerous hard enlarged painless glands in the cervical, parotid, submaxillary and occipital regions, axillæ and groins. Patient had some dyspnœa, but X-ray examination of the mediastinum revealed nothing. Heart: Was slightly enlarged and a systolic apical murmur was present. Spleen: Was distinctly palpable on deep inspiration. Face: The eyes were swollen and puffy, and there was some œdema of the forehead and distension of the superficial veins in that region. Blood: The blood-picture was typical of a lymphatic leukæmia, large lymphocytes being in great excess. The total leucocyte count was on admission 60,000.

On December 29 the benzol treatment was commenced. The initial dose was 6 minims per diem. On January 10 it was increased to 12 minims per diem, and on January 25 to 14 minims. This dose was continued until February 12, when the benzol was stopped altogether.

The accompanying graph shows the progressive diminution in the total leucocyte count during the treatment. The patient at the same time appeared to be greatly improved generally: he lost his former

¹ *Proceedings*, p. 71.

TABLE SHOWING EXACT CONSTITUTION OF THE BLOOD AT INTERVALS DURING THE TREATMENT.

	Total leucocytes	LYMPHOCYTES		POLYMORPHONUCLEARS		Hyaline	Transitionals	Myelocytes	Hæmoglobin	Total reds
		Large	Small	Neutrophiles	Eosinophiles					
December 11 ...	60,000	54	16.5	25	0.5	Per cent. 3	Per cent. 1	1 seen	Per cent. —	—
January 5 ...	57,000	53	30	13	0	3.5	0.5	0	—	—
„ 12 ...	26,000	41.5	46	10	0	1.5	1	Large number	40	4,300,000
„ 23 ...	20,000	26	24	39	1	7	3	1 seen	50	3,560,000
„ 29 ...	15,000	18	44.5	29	1	4	3.5	3 „	45	3,368,000
February 5 ...	9,000	39	29	27	1	3	1	1 „	50	3,462,000
„ 12 ...	4,500	28.5	34	32	0.5	2	2.5	1 „	60	3,300,000
„ 18 ...	3,400	41	12.5	39.5	2	3.5	1	2 „	55	5,000,000
„ 25 ...	7,000	51	14	34	0	1	0	0	—	4,500,000
March 4 ...	2,900	32	29	35	0.5	1	2.5	4 seen	60	3,856,000
April 4 ..	123,000	19	38	43	0	0	0	7 seen	62	5,000,000
„ 15 ...	15,000	19	41	35	0	4	1	2 „	58	4,384,000
„ 20 ...	20,000	25	39.5	32	1.5	1	1	0	70	5,024,000

lassitude and weakness, his appetite improved, and the oedema of the head disappeared. On the other hand, however, the spleen remained practically unchanged in size, the glandular enlargement did not become less, and the patient did not put on weight satisfactorily.

After the benzol was omitted from the treatment the leucocyte count was still taken weekly and at one time was as low as 2,900. A curious feature was noticed about a week after the benzol had been stopped. This was that the patient developed a purpuric rash on the forehead. It is well known clinically that benzol poisoning causes



Graph showing changes in the total leucocyte count.

purpura hæmorrhagica, so the rash was considered to be indicative of a mild degree of benzol poisoning.

On March 4 the patient appeared to be very well indeed and was running about the ward all day, so that he was transferred to the Convalescent Home at Broadstairs.

On April 2 he was again readmitted to hospital. The lymphatic glands were found to be distinctly harder and a trifle larger. The patient's general condition was decidedly worse. He was exceedingly languid and very dyspnoic. The total leucocyte count was now found to have risen to 123,000, and now small lymphocytes were the predominant cells present. Benzol, 9 minims per diem, was again given.

and in ten days' time the count had fallen to 15,000. This marked decrease was also accompanied by a great improvement in the patient's general condition.

On April 16 the benzol was again omitted, and on April 20 the leucocyte count was found to be 20,000.

This case seems to show:—

(1) Benzol undoubtedly has the power of diminishing the total leucocyte count.

(2) Its action is very transient.

(3) Though the total count may become normal or subnormal, still the differential count always points to a lymphatic leukæmia.

(4) A reduction in the leucocyte count is accompanied by a distinct improvement in the general condition.

DISCUSSION.

Dr. MIDELTON asked why benzol was given; whether the idea was to give an anti-microbial or an antitoxic remedy?

Mr. ROSS replied that the benzol was given on the information derived from cases of benzol poisoning. Benzol seemed to inhibit the formation of leucocytes. The ætiology of leukæmia was at present obscure.

Case showing Bilateral Hare-lip, without Cleft Palate, and also Congenital Bilateral Mucous Fistulæ in the Lower Lip.

By ALAN H. TODD, F.R.C.S.

THE patient was a healthy male infant, aged 3 months, under the care of Sir Arbuthnot Lane at Guy's Hospital. There was no history of a family tendency to deformity, nor was there any malformation in this child, except in the region of the lips. The upper lip showed a wide bilateral cleft, with marked projection of the premaxilla, but there was no cleft in the hard or soft palate. This must be a very uncommon condition; Sir Arbuthnot Lane had never seen a similar case. The lower lip showed two small depressions, symmetrically placed, at a distance of about $\frac{1}{8}$ in. from the midline; they were just large enough to admit the point of a small probe, and occasionally a bead of

gelatinous secretion could be squeezed out. The first case recorded was that described by Sir Arbuthnot Lane in the *Clinical Society's Transactions* in 1891.¹ Bland-Sutton also illustrated a series of cases, occurring in a family, in his book on "Tumours." The pathology was uncertain, but Mr. Todd suggested an analogy with the alveolo-labial glands found in this position in the lower lip of certain animals.

Auricular Flutter in Acute Rheumatic Carditis.

By G. A. SUTHERLAND, M.D.

ACUTE rheumatic inflammation of the heart is associated with changes in the endocardium, the pericardium, and the myocardium. One or more of these structures may be involved, and in some cases all are. At the present time it is generally recognized that although endocarditis and pericarditis may be present, the important question in determining the prognosis is, how far has the myocardium been involved? More especially does this apply to the muscle of the left ventricle, on which the efficiency of the circulation must in the last instance depend. If the heart does give out we are inclined to trace this to the weakening effect of the inflammatory changes in the myocardium.

There is another factor which may possibly play an indirect but important part in leading up to cardiac failure in cases of acute carditis, and that is the development of an abnormal rhythm of the heart. The onset of an abnormal rhythm does not necessarily mean that the action of the heart is irregular, as tested by the ordinary methods. In acute carditis the rate of the heart is usually greatly increased, and one is often struck by the absolute regularity of the action under this increase of rate. The ventricular action as tested at the apex is perfectly regular, and this finding is confirmed on feeling the pulse. Similarly, a long tracing from the radial artery will probably show absolute regularity in the spacing of the beats, when the cardiac rate is from 120 to 150 per minute. Various forms of youthful irregularity, which may have been present before the attack, are completely abolished when the cardiac action becomes rapid. Estimated, then, by the pulse or by the apex beat, the cardiac action in acute carditis is usually found to be perfectly regular, and from this one is inclined to infer that the normal cardiac rhythm is present. The above tests,

¹ *Trans. Clin. Soc. Lond.*, 1891, xxiv, p. 230.

however, are dependent entirely on observation of the action of the ventricles, while in the majority of cases an abnormal rhythm is developed in the auricles and not in the ventricles. If the regular action of the ventricles is not interfered with, the presence of an abnormal rhythm developed in the auricles may be entirely unsuspected, and may indeed be unrecognizable by the ordinary methods of examination at the bedside. The action of the auricles can be determined more precisely by means of the electrocardiograph and less precisely by means of the venous tracing taken with the polygraph.

I have recently met with two cases of acute rheumatic carditis in which there was apparently an abnormal rhythm of the auricles, and which was recognized only on taking a venous tracing in the neck. The form of disorder was one in which the auricular rate was greatly

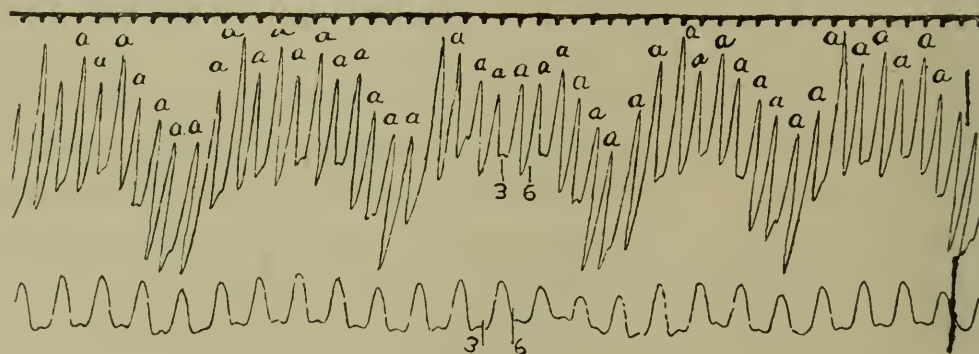


FIG. 1.

(Case I) Jugulo-radial tracing. Note the amplitude and similarity of the venous waves. If each venous wave represents an auricular contraction, the auricular rate is twice as rapid as the ventricular ($A : V :: 2 : 1$); the auricle beating 280 and the ventricle 140 times per minute.

accelerated, while the ventricle did not share in this acceleration. In other words, a number of the auricular contractions failed to be followed by ventricular contractions. Such a condition may be due to the presence of heart-block or to the failure of the ventricle to respond to all the stimuli reaching it at the increased rate. In the cases referred to the auricular and ventricular rates were perfectly regular. Taking into account the rapidity and the regularity of both auricular and ventricular contractions, I am inclined to trace the slower ventricular rate not to any interference with the conductivity of the junctional tissues (heart-block), but to an inability on the part of the ventricle to respond to each auricular stimulus owing to the extreme rapidity of the auricular contractions. It seems to be rather contradictory to speak

of heart-block when the ventricle is contracting 125 or 140 times per minute.

The first tracing (fig. 1) was taken from a female child, aged 8 years, suffering from rheumatic carditis. The lower part is from the radial artery and shows a regular action at the rate of 140 beats per minute. The slight irregularity in the force of the beats is due to movements of the arm associated with respiration. The upper part is the venous

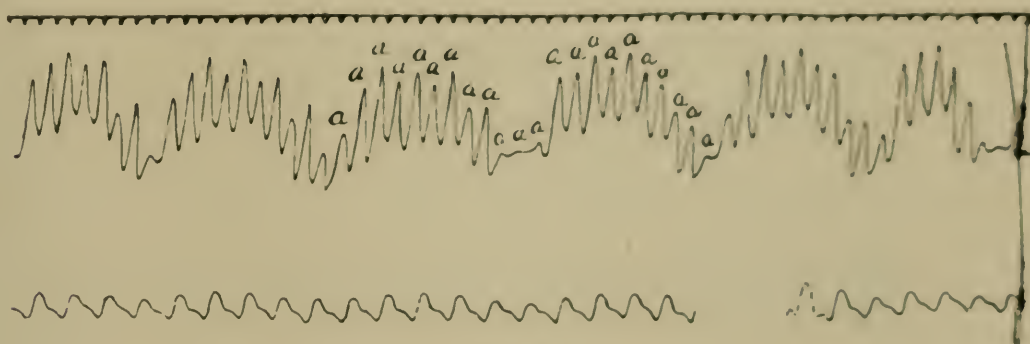


FIG. 2.

Same case, following day. Jugulo-radial tracing. Two venous waves for each radial beat (A : V :: 2 : 1). Same character of venous pulse. Auricular rate still 280 and ventricular 140 per minute. The large undulations in venous tracing are respiratory.

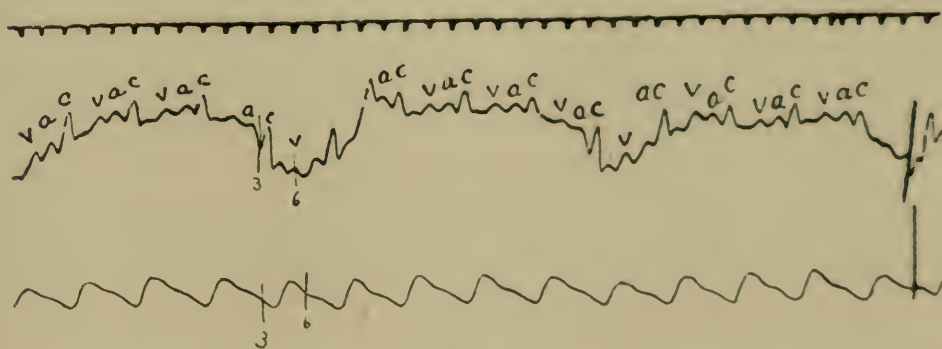


FIG. 3.

Same case, three days later. Jugulo-radial tracing. Venous tracing is now normal. Auricles and ventricles beating at the same rate, 105 per minute.

tracing from the neck. The action of the auricles as here represented is also regular and the waves occur at the rate of 280 per minute. It is suggested that each of these waves represents a contraction of the auricle. As compared with an ordinary venous tracing the following points may be noted as regards the waves: the excessive amplitude, the similar character, the identical spacing between each, and the absence of the

in rapid succession with great regularity, and not easily identified according to an ordinary venous interpretation. I have suggested, as indicated by the marking, that these waves are due to auricular contractions. They occur at the rate of 250 per minute, while the ventricular contractions are 125 per minute. The next tracing (fig. 5) was taken two days later and shows a similar condition, the auricular rate being still double that of the ventricle. A further tracing (fig. 6) was

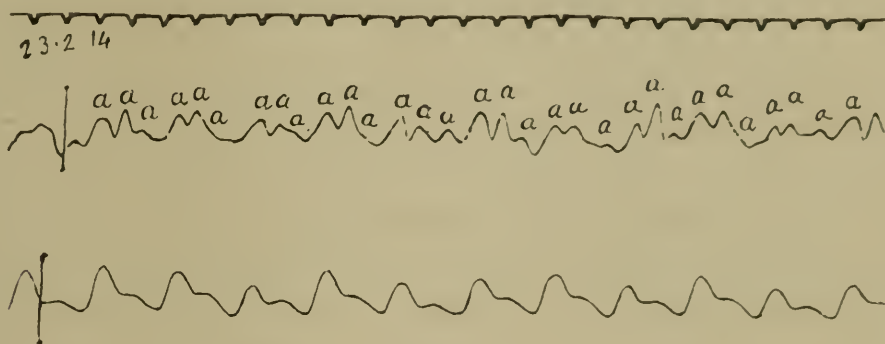


FIG. 6.

Same case, seven days later. Jugulo-radial tracing. Three auricular contractions to each ventricular contraction (A : V :: 3 : 1). Auricular rate is 390 and ventricular is 130 per minute.

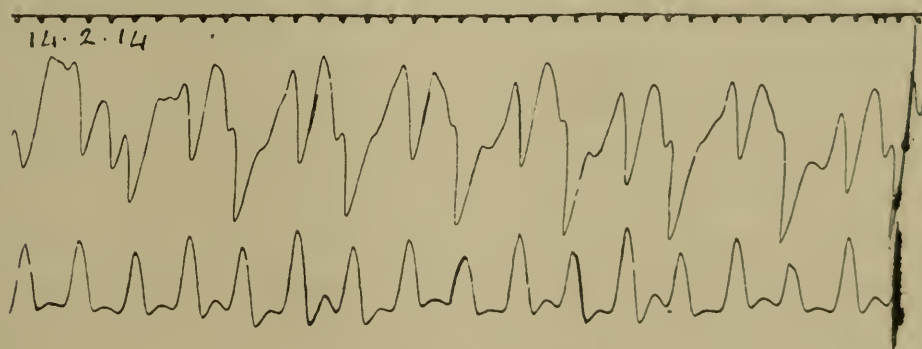


FIG. 7.

Same case. The pulsus alternans is shown in this radial tracing, and also in fig. 6.

taken a week later and shows three venous waves for every radial beat. The character of these waves suggests that they are due to auricular contractions, in which case the auricles would be contracting at the rate of 390 per minute while the ventricular rate was 130—i.e., an auriculo-ventricular ratio of three beats to one. The presence of the pulsus alternans is shown in the brachial tracing here, and also in fig. 7.

These tracings would appear to show the presence of an abnormal

action of the auricles, which seems to me to correspond in many respects with the so-called auricular flutter. I am quite aware that other explanations may be offered, and that the one suggested may be quite wrong. In acute cases such as the above the electrocardiograph, which might settle such a question, is not available for most of us, and we must still make the best of other methods of examination. In many cases of acute carditis the respiratory movements are so exaggerated that it is impossible to take jugular tracings with the polygraph, and those here shown have many imperfections owing to the respiratory distress. Among the irregularities of the cardiac action associated with diphtheria Dr. W. E. Hume¹ believes that he has found the presence of auricular flutter in two cases, the patients being aged 7 years and 5 years respectively. The auricular rates in his cases were between 480 and 500, and although no such rapidity has been found in adult hearts he suggests that the auricles of a child may be capable of attaining a higher speed than those of adults. A point in favour of the view that an abnormal rhythm was present in my cases lies in the occurrence of the pulsus alternans in one. Dr. Mackenzie informs me that in his experience that form of pulse is found in the young only in association with some abnormal form of rhythm.

Such a form of disordered rhythm may have an important bearing on the efficiency of the cardiac action. The normal mechanism of the heart consists of an orderly sequence in auricular and ventricular contractions. If this sequence is disturbed, as by auricular flutter, the ventricles will fail to receive their proper amount of blood at the proper time; they will be irregularly and incompletely filled. As a large number of the auricular contractions take place while the ventricles are in a state of systole, the result will be a reflux into the veins and a damming back of the venous blood (back pressure). While a healthy heart might continue for some time to carry on the circulation quite efficiently under this condition, the position is different when acute carditis is present. The already weakened heart may find itself hopelessly crippled by the supervention of auricular flutter, and the signs of cardiac failure may be rapidly induced or gravely aggravated. Such a result has now become familiar in connexion with an allied condition of auricular disturbance—namely, fibrillation—where the disordered rhythm leads to great impairment of the cardiac action.

As already pointed out, the condition of auricular flutter is often latent and unsuspected. As practical points for further investigation

¹ *Heart*, 1913, v, No. 1.

I might suggest that attention be paid to the following possible indications of the presence of this abnormal form of rhythm:—

(1) Attacks of cardiac asthma (great dyspnœa) occurring suddenly and without accompanying variations in the cardiac condition. In one of the above cases there were two such attacks preceding the acute illness, and they were at the time diagnosed as asthmatic in origin.

(2) A triple or galloping or cantering rhythm heard on auscultation. In both of the above cases there was a triple rhythm present, heard both at the apex and in the neck. In Dr. Morison's case of jugulo-embryocardia, which was the first example of auricular flutter recorded, each auricular contraction was audible in the right supra-clavicular region, the auricular rate being 240, while the ventricular was 114.

(3) Pericarditis without effusion and with great respiratory distress. The inflammatory changes in pericarditis are usually earlier and more marked about the auricles than the ventricles, and a disturbed auricular rhythm may follow from the active effusion in and around the auricular walls.

(4) Dyspnœa, cyanosis, and enlargement of the liver are out of proportion to the physical signs of disease in the heart.

(5) The presence of the *pulsus alternans*.

Further investigations will be required to determine whether in cases of acute carditis a disordered rhythm of this nature is often present. If it is found I should be more hopeful of the treatment, for a disordered rhythm will respond to treatment by means of digitalis much better than will a ventricle weakened by acute inflammation or toxæmia. If we can control the rhythm we shall place the patient in a much better position for weathering the attack. On the other hand, if we cannot control the disordered rhythm it may be found that the prognosis is made materially worse by the development of this abnormal auricular action, as compared with those cases in which no such disorder of the mechanism is present.

Case I.—A female child, aged 8 years, was admitted with the history of pain in the neck for a week, and more recently of pains in the knees and hands. There was no history of previous rheumatic infection. On admission her temperature was 101.2° F., the pulse was 132 and regular, and the respirations 30. There was no actual swelling of the joints, but pain on movement was complained of in both wrists, in the fingers and in the knees. The tonsils were definitely enlarged. The apex beat of the heart was palpable in the fourth space a quarter of an inch outside the nipple line. The right border did not extend beyond the right edge of the sternum. The apex beat and heart

sounds were feeble, but the ventricular action was regular. On auscultation a well-marked triple rhythm was heard at the apex, described as cantering, and ascribed to a reduplicated second sound. No murmur was present. She was ordered 1 dr. of salicylate of soda daily. On the third day after admission the temperature reached normal, and did not rise again. The arthritic pains soon passed off, but the pulse-rate slowed down very gradually. The triple rhythm of the heart was not heard after the second day. There was progressive dilatation of the heart on the left side, until the apex extended $\frac{3}{4}$ in. outside the nipple line, and a systolic murmur became audible at the apex. At the end of a fortnight the pulse was regular and good at 80 per minute, and the dilatation was less. She has been kept under observation for five months, and has had a good deal of rest, as the cardiac rate runs up quickly to above 100 on any exertion, and a varying amount of dilatation has persisted.

Case II.—A female child, aged 6 years, was admitted to hospital with a history of two days' illness, characterized by pain about the heart and left shoulder, shortness of breath, loss of appetite, sleeplessness, and depression. There was no history of rheumatic fever, but eight months previously the mother was told by a doctor that the child had heart disease, which caused the shortness of breath from which she suffered. Six months previously she had been in hospital owing to an attack of acute bronchitis. At that time the heart was found to be slightly dilated, and there was a systolic murmur following the first sound at the apex, and conducted well into the axilla. The bronchitic signs soon disappeared, but on the fourth and sixth days after admission she had attacks of severe dyspnœa, lasting for a short time, and regarded as asthmatic in character. On admission the temperature was 102°F. , the pulse 140, and the respiration 72. The child looked very ill, the face was pale, and the expression anxious and pained. A troublesome cough was present, which aggravated the pain about the heart. There was orthopnœa, and the lungs presented the signs of œdema and bronchial catarrh. There was diffuse præcordial pulsation, and both sides of the heart were dilated. A well-marked pericardial rub was present over an area extending from the apex to the sternum. Intra-cardiac murmurs were difficult to distinguish, but a systolic murmur could be heard at the apex. The liver was much enlarged, and the veins of the neck pulsated markedly. The illness ran an irregular course, but there was never any definite improvement. The temperature fluctuated, but seldom rose above 100.5°F. The area of cardiac dullness increased, extending $1\frac{1}{2}$ in. beyond the nipple line on the left, and $\frac{3}{4}$ in. beyond the right border of the sternum. This was clearly due to dilatation of the heart, as pericardial friction was also present and extending. Pleural friction appeared in the right and then in the left axillary region. Pain in the left shoulder was much complained of. This seemed to be definitely cardiac in origin, for there was no evidence of arthritis, and the arm could be moved freely without discomfort. There was always a mitral systolic murmur present, and at times a diastolic one. The pulse continued rapid, averaging

about 120, and was soft and dirotic. Coughing was often troublesome. Dyspnoea was also present, and was sometimes aggravated by paroxysmal attacks of great severity. Vomiting occurred at times. Towards the end, which came on the eighteenth day of the illness, some œdema of the lower extremities and of the vulva was present. At the necropsy the pericardium was found to be adherent to the heart, and intimately so at the base. The pericardium was thickened, acutely congested, and lined with gelatinous exudate. The heart was very much enlarged. The walls were congested, and on section dripped blood. All the cavities were dilated. The valves presented no change, save that the margin of the mitral valve was thick and puckered. There was collapse of the lower lobe of the left lung, and a patch of pleural thickening and congestion (recent) over the base of the right lung. A microscopic examination of the cardiac tissues has not yet been made.

Case of Acute Partial Heart-block.

By A. HOPE GOSSE, M.B.

S. P., AGED 12 years.

History : As a child the patient had frequent sore throats. At the age of 10 years he was admitted to the London Hospital with rheumatic pericarditis. After he was discharged he remained as an out-patient for eight months on account of persistent præcordial pain. At the age of 11 years he was again admitted with acute rheumatism, and remained an in-patient for two months. He was transferred to the Cardiac Department under Dr. Mackenzie, and after two months as out-patient was admitted a third time on account of increasing præcordial pain. It was on this occasion while under observation that he developed acute heart-block.

Course : Apart from an attack of tonsillitis immediately after admission his chief symptom throughout was præcordial pain. He also had irregular pyrexia for thirteen days, and it was during this period that he dropped beats. The jugular tracings show that he had a normal $a-c$ interval (less than one-fifth of a second) on admission. This interval increased to over one-fifth of a second in about a fortnight, and three weeks after admission the dropped beats occurred, associated with an $a-c$ interval reaching two-fifths of a second. The dropped beats occurred on two consecutive days, and then the $a-c$ interval gradually diminished and on discharge of the patient it was equal to one-fifth of a second. On one of the days of the dropped beats he had an attack of

more severe præcordial pain during which he became cyanosed, had distress in breathing, and a small pulse. The attack soon passed off. After discharge his *a—c* interval was still one-fifth of a second and under.

Apart from the temporary heart-block he has an adherent pericardium, aortic incompetence, and rheumatic nodules, but these present no special features. Blood cultures taken when in hospital were negative.

The case is, I think, especially interesting in that there are graphic records before the block developed, as well as with the block and after it.

DISCUSSION.

Dr. ALEXANDER MORISON said he was interested to hear of the large number of cases of auricular flutter which Dr. Sutherland had himself observed, as, until last year, the total number collected from the literature was only thirty. The case referred to, which had been under his (the speaker's) care at the Great Northern Central Hospital in 1903, was peculiar in that the auricular sounds were audible. The condition was accidentally discovered in the course of jugular auscultation. They bore a close resemblance to those of the foetal heart, and he had therefore termed the condition jugular embryo-cardia. He had only occasionally since heard something resembling them in cases in which the auricle was distended in cardiac failure, but never again so distinctly. There were about two auricular pulsations to one ventricular (240:114), and their comparatively slow rate probably accounted for their force and audibility. The actual vibrating medium was probably the jugular valves of the bulb and the contained blood. He did not know why Dr. Sutherland should doubt that his were cases of auricular flutter; it was difficult to account for the succession of well-marked waves except on the supposition that the auricle was acting twice or thrice as often as the ventricle, and although "flutter" was a term commonly used, he did not understand why it should not be called auricular tachycardia; they certainly *seemed* to be pulsations of the auricle, although it was possible that ventricular action might cause some mechanical vibration. The ventricular rate did not seem to have borne a definite ratio to the auricular rate, but this he did not regard as necessary. In the case described by Dr. Gosse there was a condition of so-called "block." He did not wish to appear presumptuous in questioning a view so commonly held, but he did not see any necessity for considering that the one had any relation to the other. The conceptions of the growth and relations of the nodal structures were at present absolutely unsettled, or should, in his opinion, be so regarded. He did not deny that these nodal structures had some relation to the heart beat. The question was whether, in these cases of auriculo-ventricular discord, one was dealing with a condition originating in muscle and

propagated by muscle, and the auriculo-ventricular node was to be looked upon as a spring-board from which impulses from above were transmitted; or whether one was dealing with a more complex condition in these structures, of the nature of muscle spindles, regulated by the nervous system. In the latter case one could understand why it was that many auricular beats did not "come through," as the term goes, but which need not for that reason be regarded as "blocked." The ventricular action seemed capable of taking care of itself, while its rate was not necessarily determined by that of the auricle. He asked Dr. Gosse privately whether he had noticed any alteration in the rhythm on movement made by the patient, but he had not done so. It would be interesting to make that observation in such cases. In the majority of cases of what could truly be called "flutter" there might be a very great disproportion between the beats of the auricle and the ventricle, and the auricle might have reached its maximum rate and be uninfluenceable by accelerants, as was first shown in the case published by Hertz and Goodhart. But one was capable of accelerating the ventricle by atropine. Therefore, even on generally accepted lines, one would hesitate to say that an accelerable ventricle was subject to muscular block when a dose of atropine could raise the ventricle to a higher rate than it had before. This criticism applied if by "heart-block" one was only to understand a muscular transmission through these structures. In the genesis of these structures there was a certain period in the evolution and development of the heart when septation occurred and the auriculo-ventricular node sent its bundles or branches down on both sides of the inter-ventricular septum by bifurcation, but it could not bifurcate until there was a septum to receive the branches. The auriculo-ventricular bundle was therefore of comparatively late development in the embryology of the heart. He considered he was the more justified in expressing this opinion as he was not speaking altogether hypothetically, for he had exhibited a case of congenital malformation in this Section which, on examination, showed a remarkable condition of the node and bundles. There was a large inter-auricular space—the so-called foramen primum—and the auriculo-ventricular node was sub-epicardial. While the right bundle supplied both ventricles, there was a diverticulum to the left of the node, which was itself divided by fibrous tissue. This curved round the back of the left auricle and tried twice, by branching, to reach the ventricle, but without success. This fact was, he considered, sufficient evidence that, in this case, one was not dealing with the aboriginal cardiac tube, but with a growing differentiation of mesoblast, which supplied the ventricles and influenced their action in a later stage of the development of the heart, and which had other than a merely conductive function on muscular lines. That function he considered to be related to and regulated by the nervous system, and not dependent upon the muscular movement of the auricles.

Dr. JOHN PARKINSON expressed himself as being very interested in Dr. Sutherland's observations. Most of the work in connexion with auricular flutter had been done in cases of chronic disease, which were readily observed.

It would require time and further patient observation before the tachycardias of acute infections could be definitely separated off into their natural groups. He considered the cases now recorded were instances of auricular flutter, and the only thing which made him hesitate—as Dr. Sutherland himself had hesitated—was the fact that certain cases had been seen in which jugular tracings seemed to indicate flutter, yet electrocardiograms showed that flutter was not present. There were a few such cases, and they formed a difficulty which Dr. Sutherland acknowledged. He hoped it would soon be possible to understand why polygraphic records led one astray, because in acute conditions polygraphic tracings had many advantages; it would be a great pity if investigations at fever hospitals should be stopped, or limited, by the fact that an electrocardiogram was not obtainable. There was a very wide field for such work as Dr. Sutherland was doing. In the future the whole of the various infections might be studied from this point of view, and results would be obtained of scientific importance, of prognostic value, and having a bearing on treatment.

Dr. SUTHERLAND said that the Section was fortunate in having had the demonstration by Dr. Gosse. It was curious that, though the subject of disordered rhythm of the heart had not previously been dealt with at the Section, two papers on the matter should have been read at one meeting. Dr. Gosse's illustrations of heart-block in acute disease were very interesting. In some of Dr. Gosse's tracings he thought he detected the pulsus alternans. In reply to Dr. Alexander Morison, he agreed that the name "auricular tachycardia" was preferable to that of auricular flutter.

Dr. GOSSE replied that he agreed one of the tracings apparently showed definite pulsus alternans in connexion with about six of the radial beats.

Section for the Study of Disease in Children.

May 22, 1914.

Mr. SYDNEY STEPHENSON, Vice-President of the Section, in the Chair.

Specimen showing Part of a Hydatid Cyst of the Brain of a Boy, aged 10 Years.

By C. PAGET LAPAGE, M.D.

THE boy first came under observation in November, 1912, when after an accident and injury to the head he developed signs of cerebral tumour (optic neuritis, headache and vomiting), but with no definite localizing signs. A history of supposed tuberculous illness suggested that the tumour was tuberculous, and treatment with tuberculin apparently gave rise to definite improvement. Later, localizing signs—weakness and tremor of the right arm and leg and face—together with convulsions, developed, and gradually became very marked. The tumour was apparently tuberculous, but it was agreed, in consultation with Mr. Rayner, that an exploratory operation should be performed.

On incising the dura a large amount of clear fluid escaped; no brain matter could be seen, but the wall of a cyst presented at the opening and part of it was removed for examination. The cyst was very large and appeared to fill a considerable part of the left side of the cranium. A small drainage-tube was left in and through this large amounts of cyst wall and clear fluid came away. The boy regained consciousness, but gradually sank and died three weeks later, after having developed hernia cerebri and meningitis. No post-mortem examination was allowed. The pathological report showed that the cyst was a hydatid.

Hydatid cysts of the brain are not very rare and, on looking through the literature, one finds many references. Soltmann [6] records a case of a pea-sized hydatid in the brain of a child, aged 1 year, who had died of another disease. Henry Ashby [1] records a case of a large cyst in the frontal lobe of a boy aged 8 years (post-mortem report). Several observers state that successful operation is rare, but Mudd [5] and Graham and Grubbe [3] record successful cases of removal in older children. Amongst the references to cases of hydatid cysts of the brain occurring in children are the following :—

- [1] ASHBY, HENRY. *Brit. Journ. of Child. Dis.*, 1904, i, pp. 51-55.
- [2] BENNETT, J. R. *Med. Times and Gaz.*, 1862, i, p. 80.
- [3] GRAHAM and GRUBBE. *Australas. Med. Journ.*, July, 1890; abstract in *Lancet*, 1890, ii, p. 572.
- [4] HARLEY. *Lancet*, 1867, i, p. 612.
- [5] MUDD. *Internat. Journ. of Med. Sci.*, 1892, ciii, p. 412.
- [6] SOLTMAHN. *Lond. Med. Record*, 1883, xi, p. 254. Abstract from *Centralbl. für die Med. Wissensch.*, March 14, 1883.
- [7] WHITTELL, S. *Lancet*, 1870, ii, p. 533.

Case of Mongolian Imbecility.

By J. J. M. SHAW, M.D.

Boy, aged 3 years, born at full time. Labour was slow, and the child, which weighed 10 lb., is said to have been almost asphyxiated. The mother was aged 34 years when this her only child was born. There is a history of tuberculosis on the maternal side. The head is brachycephalic, and the facies is characteristic. The complexion is florid, the epicanthic folds are large, and the lips are fissured. The little fingers are incurvate, and the toes, although presenting no abnormal cleft between the great toe and the next, are unusually mobile. The child is very good-tempered and is a stranger to shyness. His speech is very defective, and his code of gestures and strange noises is unintelligible except to his parents. Dentition did not commence until the age of 16 months, and his cry is that of an infant.

DISCUSSION.

Dr. SHAW added that at the date of the child's birth the father was 40 years of age. The child was remarkably healthy. Dentition was markedly advanced by giving the child cod-liver oil and syrup of phosphate of lime.

Dr. LAPAGE asked whether Dr. Shaw had noticed in this case the peculiar shape of the ear which had been spoken of by Dr. Hunter, of the Royal Albert Asylum. The upper part of the ear, instead of describing the usual curve, was folded over short in a broad fold, the top of the concha being wider than usual. It was well known, also, that the lobule of the ear was often deficient, and the whole ear smaller than usual.

Dr. SHAW replied that he did not regard this child's ears as a departure from the normal. The ears of some such children varied a good deal while still considered normal, in contrast with the definite abnormalities observed in others.

Spina Bifida Occulta.

By ERIC BELLINGHAM SMITH, M.D.

J. W., MALE, aged 6 years, was brought to the Queen's Hospital for Children on May 16, 1914, for incontinence of urine. On examination the bladder was found to be distended as high as the umbilicus, and there was a constant dribbling of urine from the penis. The chief feature of interest about this boy, however, is the condition of the buttocks. These are flattened at back, buttocks and posterior surfaces of the thigh practically present a level surface. The vertical cleft is entirely absent, and the anus is exposed and appears to look directly backwards. There is a weak gluteal fold. The prominences of the trochanter and tuber ischii are well marked, and there is a cavity between them which is only filled by skin and fascia. Deep to this the deep external rotators of the thigh can be palpated, but the whole of the superficial gluteal muscles are absent. The muscles on the anterior and posterior aspects of the thigh are distinctly hypertrophied. The calf muscles give the impression that they are smaller than normal. This defect is, however, more apparent than real, and is probably produced by the marked hypertrophy of the thigh muscles above. The condition is absolutely symmetrical, and there is no affection of the trunk or arm muscles. The defect in question also produces no disabilities. The child runs, walks and rises readily from any position in which he is placed. There has been no progressive wasting, and the condition has existed since birth. The boy has never exhibited any control of his urine since babyhood, and from time to time there has been incontinence of fæces. The reflexes are present and normal, and the mental condition is average for the age.

DISCUSSION.

Dr. BELLINGHAM SMITH added that the diagnosis¹ and notes of the case which the Section had before it were based on hurried and superficial observations made previous to an X-ray and other examinations. These later investigations left no doubt in his mind that the proper diagnosis of this case should be one of spina bifida occulta. He supposed that three conditions had to be discussed: (1) Was it a case of simple congenital deficiency? (2) Was it a case of myopathy? (3) Was it a case of spina bifida occulta? In favour of the first view was the fact that the condition had existed since birth. Against it was the paralysis of the bladder and rectum. Under observation it was noted that the bladder was in a permanent state of retention and overflow. A rectal examination revealed (1) a patulous sphincter ani and (2) a hypertrophied bladder wall. In favour of a diagnosis of myopathy was the apparent hypertrophy of some muscles and wasting of others, but directly opposed to it were the facts that the condition had existed since birth without making any progress, that there were none of the motor disabilities that would be expected in a case of myopathy that had progressed to the stage evident in this child. Lastly, there was the incontinence of urine and fæces, and associated with these changes the X-ray plates showed an entire absence of the last four segments of the sacrum and the coccyx. He thought that these last two facts, taken in conjunction with the other points, suggested that the correct diagnosis was one of spina bifida occulta. He had to admit that there were no sensory changes, no deformities of the lower limbs, and no sacral scarring or hirsuties, but he believed he was correct in saying that spina bifida occulta might occur without these changes being necessarily present. In conclusion, he would like to add that he believed this case was almost identical in all its features with one that Dr. Cockayne had shown the Section in May, 1913, and he would suggest to Dr. Cockayne that the diagnosis of myopathy that had been made on that occasion was incorrect and should rather be one of spina bifida occulta.

Dr. COCKAYNE said there was a difference of opinion expressed on his own case twelve months ago, and the mother was at that time definite about it having developed after birth, and the diagnosis of myopathy was based upon this; but he had since seen other members of the family, and they were equally sure that the condition was present at birth. When showing the case he said the skiagram showed no abnormality. He did not see the skiagram, but took the report upon it, as it had got broken. But another had since been taken, and it showed a definite defect of bone; the coccyx was absent, and there was a wedge-shaped defect of the last two sacral vertebræ, and the transverse process of the last lumbar vertebra was joined to the sacrum on the left side, though not on the right. The glutei were present but very small,

¹ This was "congenital absence of the gluteal muscles."

and the muscles below the knee were even smaller in this case than in Dr. Bellingham Smith's, and the hypertrophy of thigh muscles was greater. There was no sensory change in his case, and the reflexes were normal. There was incontinence of urine and of fæces. A reference to the description and photographs published in last year's *Proceedings*¹ would show how closely the two cases resembled one another. There was no doubt both were cases of spina bifida occulta.

Congenital Defect, Sixth and Seventh Cranial Nerves.

By ERIC BELLINGHAM SMITH, M.D.

B. K., MALE, aged 3 years. Brought to Great Northern Central Hospital for weakness of one side of face. This defect has been noticed since second week of life. Delivery was moderately easy, and no instruments were used. There is complete seventh nerve paralysis on right side, and also paralysis of the external rectus on the same side. The condition suggests congenital defect of the sixth and seventh cranial nerves.

The CHAIRMAN (Mr. Sydney Stephenson) said he saw a number of cases of congenital ophthalmoplegia, affecting nearly always the sixth nerve, and usually on both sides, but the amount of the defect was often unequal. The cases were often regarded as paralysis of the sixth nerve on one side, but careful examination revealed the fact that the sixth on the other side was also affected. It had been said that the internal muscles of the eye never participated; that it was an ophthalmoplegia externa, not an interna, and he believed that to be generally true. But he had published a case in which the third nerve on one side was paralysed as a congenital defect, but where the ciliary muscles and the nerve of the iris were also affected. He thought the explanation which fitted these cases better was the theory of aplasia of the nerve nuclei. His experience did not enable him to confirm the view often stated, and which was current among ophthalmic surgeons, that these defects were usually due to absence or mal-position or ill-development of the muscles themselves.

¹ *Proceedings*, 1913, vi, p. 184.

Osteoperiostitis of the Tubercle of the Tibia.

By CHAD WOODWARD, F.R.C.S.

A. V., AGED 11 years, has complained of pain over the tubercle of the left tibia for six months; as she tires the pain grows worse. There is an obvious swelling over the tubercle and tenderness is especially marked on the inner side. The skiagrams show the condition described by Schlatter and others.

Mr. CHAD WOODWARD added that the condition was described long before Schlatter wrote about it, by Sir James Paget, but the latter had not the advantage of skiagraphy, and Schlatter was able by this means to make his thesis much more complete, hence the association of his name with the condition. Recently, Americans had tried to attach Osgood's name to it. Some said it was always due to direct violence, and others said that this spur-like projection originated in a centre of ossification other than the head of the tibia, and that the junction of the two became fractured. The present case upset some of these views on the subject: it showed that in the leg, where there was no disease, the tubercle was ossifying from a separate centre. On the side where the periostitis occurred there was no second centre. He regarded it as a mechanical condition, an isolated expression of a more general condition of skeletal conformation. It was fairly common among school-boys: and they were liable, in the course of their games, provided they possessed a particular but at present undefined skeletal conformation, to get an indirect pull through the ligamentum patellæ upon the tibia, and there was an irritation and tearing of the periosteum which passed over the tubercle on to the other parts of the tibia; hence this chronic inflammation was set up. The skiagram showed that bone cells passed out into the tissues, and, often spreading up the ligamentum, produced ossific spots. Having seen a number of cases in the past few years he had formulated certain views, but would not now enter into them. The patients got well in time. Some said it was a tuberculous condition, but he had excised portions, and subjected them to examination, and there was no sign of tubercle at all. They got well as soon as the cartilage between the bone and the tubercle ossified. He had had good results in two cases, where speedy cure was desired, by operation. He gouged away as much as possible of the cartilage, drove the spur of bone down into the bed, and sutured the periosteum over the top. This produced an amount of callus which ossified, and in a couple of months the case was cured. One recent case—that of a naval cadet who had lost two sessions' work owing to pain and disability, and it was feared he would have to leave the Navy—was cured by operation. He was playing tennis eight weeks after the

operation. In a number of cases there was associated pes cavus, which might be responsible for the oblique pull of the ligamentum patellæ, and in this case he intended to see if an alteration in the boots, producing slight varus, would do instead of operation.

Injury to the Deep Branch of the Ulnar Nerve.

By CHAD WOODWARD, F.R.C.S.

C. L., AGED 15 years, fell on to a spike in June, 1913, and wounded his left wrist and palm. The wound was infected and healing occupied some weeks. There is paralysis of the interossei, ulnar lumbricales, and adductors of the thumb. Owing to the absence of sensory changes this lesion is prone to be overlooked at the time of the injury.

Mr. CHAD WOODWARD added that he had such a case two years ago. He could find in the literature only four published cases. Mr. Sherren had seen only three or four, and had operated upon one. That made ten altogether in recent years. The patient could not get better as he was now, and in spite of the time since the accident, he would operate. In the other case, in which he was practically driven to operate by the parents, the patient was infinitely better eighteen months after the operation. Though the wasting of the interossei had not quite vanished, the writing had improved so much that those muscles must have regained some of their power. He proposed to cut down, and try to find the spot at which the nerve was injured. In the other case he found a stump neuroma. He would try to effect an anastomosis between the two ends of the nerve.

Old Injury to Elbow.

By CHAD WOODWARD, F.R.C.S.

F. P., AGED 7 years, fell on to a stone in August, 1913. Was treated with a splint for "fracture of a small bone and a bone out of place." All movements are now remarkably free, but the arm is very weak. The skiagram shows an anterior dislocation of the radius and the site of fracture of the ulna.

DISCUSSION.

Dr. BELLINGHAM SMITH asked what results Mr. Woodward had seen in previous cases of operation on old dislocation of the radius. He (the speaker) had seen only two, both in children, both after operation—one had more than a single operation, and the condition seemed to be no better.

Dr. CAUTLEY asked how Mr. Woodward explained the weakness of the arm in this case. One would not think that mere dislocation of radius forwards would prevent the child carrying things about.

Mr. WOODWARD replied that his experience of dislocation injuries at the head of the radius was almost confined to adults, in which he had had successful results by excising the head of the radius. Last year a lady fell down, and her elbow became useless. Four months later there was a very little flexion or extension, and no pronation or supination; she was unable to do up her back hair. The head of the radius had been broken, and excision of it restored perfect function. This case was different. As the child extended the arm there was a loud click, and the radius jumped forward. On flexion the radius could be pushed back into its proper position; so that here the operation should be not one of excision but efforts should be directed to fashioning a new orbicular ligament. He did not see why it should prevent things being carried, except for the strain on the interosseous ligament.

Case of Tremor.

By FREDERICK LANGMEAD, M.D.

THE patient is a girl, aged $7\frac{1}{2}$ years, who shows a peculiar tremor of the upper extremities. It is unassociated with any evidence of organic



Case of tremor.

disease, either in the nervous system or elsewhere. The tremor is shock-like in character and brought out by volitional movement. It is more marked in the right arm than in the left, and on the more affected

side flexion of the elbow is always associated with some degree of pronation. This appears to be compensatory, for there is no observable organic cause for it, and a skiagram of the elbow shows no defect. When the patient writes the tremor is much in evidence, and writing is almost impossible unless the arm be steadied. This the patient has learnt to do by forcibly apposing the closed fist of the other side against the radial side of the wrist of the writing arm. A tremor of this character would suggest a lesion of the cerebello-rubro-spinal tract, in some part of its course, but there is no additional evidence to support such a contention. The gait is normal. The movements were first noticed when the child was aged 7 months, and there is no history that they followed an acute illness. They are probably congenital in origin, and like those met with as a familial affection, but there is no record of it occurring in other members of the family.

Dr. CAUTLEY said he thought it probable that the tremor was due to a mild attack of encephalitis. He had seen similar tremor in the course of encephalitis clear up completely; but as this had gone on so long, and did not improve, it indicated permanent damage to the brain, and the prognosis was bad.

Case of Abnormal Development and Fragility of the Bones.

By FREDERICK LANGMEAD, M.D.

S. P., A BOY, aged 9 years 7 months, has always been backward, physically and mentally. He sat up at the age of 2 years 9 months, walked first when aged over 3 years, but is said to have begun to talk at the age of 1 year 6 months. He could do nothing for himself, such as doing up his buttons, until aged over 5 years. His mother is afraid to let him out by himself as he is inclined to run without reason into traffic. He lies awake at night for several hours on end, but does not appear to be frightened and cannot explain his wakefulness. He is extremely nervous. He has broken his arm on two occasions: when aged 4 years and again when aged 7 years. The fractures were easily produced and occasioned by only very slight falls.

His appearance is peculiar. He is very ill-nourished. The chest is small and ill-developed though not deformed in any way, and its expansion is very limited. His limbs are long and thin, as also are his fingers and toes. The eyes are somewhat staring and lids a little

retracted. Both testicles have descended, but perhaps are somewhat small. Urine: Specific gravity 1008-1012, no albumin or sugar. No increased frequency of micturition. The pulse is not easily felt; arteries not thickened. Blood-pressure apparently equals 130 mm. Hg.

Skiagrams of the bones, which are exhibited, show that the bones are very delicate in construction and unusually translucent. The Wassermann reaction is negative. The blood-picture is normal.



Case of abnormal development and fragility of the bones.

Remarks.—At first the patient's appearance suggests the condition of progeria described by Mr. Hastings Gilford, and the high blood-pressure would support that view, but the hair is not particularly thin, nor does it show senile changes. The arterial walls are not thickened. In such a condition fragility of the bones might conceivably occur. He does not appear to be an example of any of the classifiable varieties of infantilism, though at present it is difficult to say that the

organs of generation are not primarily at fault. There is no evidence of defect in the ductless gland system. The combination of infantilism, bone abnormalities, and long fingers and toes, suggests some form of dyspituitarism, but he cannot be considered an example of either hypo- or hyper-pituitarism. The skiagram of the base of the skull shows that the sella turcica is both small and normal in shape. There is neither polyuria nor glycosuria. The high blood-pressure raises the question of renal infantilism, but polyuria, polydipsia and albuminuria are all absent. It is obviously desirable to keep him under observation for a long period to see if he will ultimately conform to any known type.

DISCUSSION.

The CHAIRMAN said he thought both the sclerotics of this child were bluer than usual, and particularly the right eye. Therefore the question arose whether it was an example of the symptom-complex characterized by blue sclerotics and undue fragility of bones.

Dr. CROOKSHANK asked whether this was an example of the type of boy who went out for long walks at night. Long, thin fingers and toes are features of boys who, later, enter asylums as cases of dementia præcox.

Dr. F. PARKES WEBER asked whether undue length of feet and hands was recognized as a special feature in any particular class of cases. A boy with extraordinarily long fingers and toes was shown by Dr. F. J. Poynton, at the Medical Society of London, in 1903.¹

Dr. CAUTLEY remarked that hands and feet of the type possessed by this patient were also seen in cases of amyotonia congenita.

Dr. LANGMEAD replied that the boy was not particularly fond of going out at night. There was no history of epilepsy. He did not think the hands and feet were of that monkey-like form, with flat thenar and hypothenar eminences, which one associated with dementia præcox.

Case of Multiple Arthritis for Diagnosis.

By HUGH THURSFIELD, M.D.

THE patient was a girl, aged 7 years. Only child; one died a year later. Painless joint swellings for three weeks. Arthritis in both ankles, knees, wrists, elbows, and all interphalangeal joints. Neck movements limited.

¹ F. J. Poynton, "A Case of Atavism," *Trans. Med. Soc. Lond.*, 1903, xxvi, p. 338.

DISCUSSION.

Dr. H. D. ROLLESTON mentioned a somewhat similar case, in a boy, aged 8 years, who, when first seen, had symmetrical painless swellings, resembling peri-articular ganglia, over both wrists and ankles. The child's mother said that they had existed since birth. The child was under observation for thirteen months, and had albuminuria, uræmic symptoms, an attack of pericarditis, and eventually fluctuating swellings in connexion with the knees and elbows, and over the skull-cap. The necropsy showed widespread tuberculous ostitis at the ends of the long bones. The peri-articular swellings contained thin purulent fluid. There was tuberculous ostitis of the second dorsal vertebra, and caseous masses in the liver. There was no pulmonary tuberculosis. The lymphatic glands throughout the body were also tuberculous. The kidneys weighed 1 oz. each, and were small, pale, and granular. The left ventricle of the heart was hypertrophied.

Dr. F. PARKES WEBER said it was difficult to believe that in the present case the joint condition could be due to tuberculous lesions in the neighbourhood of the joints, for the change was a general or widely spread one, affecting both knees and ankles, and there was also some spindle-shaped thickening about the finger-joints. Still, some toxic or toxæmic condition in the body suggested itself.

Mr. CHAD WOODWARD said he had seen bilateral painless effusions in the knee-joint due to the gonococcus, and that was a possible cause in this case. One was accustomed to expect the swelling of gonorrhœal arthritis to be always somewhat hard and red, and very painful, but this was merely the acute form in which peri-articular inflammation predominated. One should not forget the gonorrhœal serous arthritis which might be polyarticular, and was usually associated with free movement and absence of pain. The child should be examined for a possible vulvo-vaginitis.

Dr. CAUTLEY thought the case was more likely to be one of syphilitic disease.

Dr. THURSFIELD replied that he took the view that it was syphilis, because he did not know of those other causes of symmetrical painless swellings mentioned by Dr. Rolleston and Mr. Chad Woodward. He thanked those gentlemen for the opinions they had expressed. He would have a Wassermann reaction done, and would urge that the fluid from the knee-joint should be withdrawn and examined. By these means he hoped the diagnosis would soon be settled. (A Wassermann reaction proved negative, even after a "provocative" dose of salvarsan.)

Nervous Cretinism.

By Major R. McCARRISON, I.M.S., M.D.

IN a paper entitled "Observations on Endemic Cretinism in the Chitral and Gilgit Valley," which I read before the Medical Section of this Society in November, 1908, I drew attention to the frequent association of a definite train of nervous symptoms with cretinism. These symptoms were present in 71 cases among a total of 203 cretins, and appeared to me to constitute a definite type of disease to which I applied the term "nervous cretinism." I was well aware then, as I am now, of the objections to the use of this term, but in distinguishing these cases by a distinctive title I had hoped to focus attention on a condition the dependence of which on congenital hypothyroidism had, so far as I am aware, previously escaped recognition.

My object in making this further communication is to point out the comparative frequency with which this type of cretinism is to be met with, and the necessity for its early recognition; and, further, to insist on the fact that the nervous, in common with the cretinoid, symptoms which characterize it are due to thyro-parathyroid deficiency.

SYMPTOMS OF THE DISEASE.

The symptoms of this type of cretinism were fully discussed in my original paper [11] and are, in brief, a combination of congenital myxœdema (cretinism) with congenital cerebral diplegia, in all their varying grades. In one case the myxœdematous signs may predominate, in another the diplegic. As a rule, it is easy to detect the well-known signs of myxœdema, but there are rare instances in which these signs are almost wholly wanting. The dolichocephalic skull and the facial appearances may afford important indications of the nature of the case, since myxœdematous signs are often to be observed in the face and head when they are absent from other parts of the body. Where the nervous symptoms are predominant there is often a lesser degree of stunting of growth than is the rule in the purely myxœdematous type of the disease. The signs of derangement of the central nervous system may vary from the slightest degrees of paraplegia to the most intense grades of spasticity, athetosis, fits, and idiocy. Nystagmus, which is rare in the purely myxœdematous form, may be present in these cases.

and squint is common. Such extreme examples of this type of cretinism may be indistinguishable from cases of "cerebral diplegia," and it is only by the recognition of the scanty myxœdematous signs of the malady, and by the application of the therapeutic test of thyroid medication, that their true nature can be appreciated. Sufferers from the lesser degrees of the affection are backward in their physical and mental development, slightly cretinoid in appearance, slow to cut their teeth, to talk or to walk, paraplegic, afflicted with stubborn constipation, or, it may be, with enuresis. The constipation may be due in part to the functional inefficiency of the nervous mechanism which controls peristalsis, but is in part due also to the lack of thyroïdal activity, which is so important an influence in stimulating the secretion of the succus entericus [9].

PREVALENCE OF THE DISEASE.

Turning now to the question of the frequency with which "nervous cretinism" is met with, my original account of the condition, 1908 [11] will make it clear that it is common in goitrous districts. Chagas [2], when he published his description of the so-called "parasitic thyroiditis" of Brazil, in 1911, referred to the common occurrence of cases of "cerebral diplegia" of all degrees of severity, in children who had suffered from this thyroiditis. In referring to what he has described as the "chronic forms" of this affection Chagas differentiated a "nervous" as well as a "myxœdematous" and other types. His description of the first, and the appearance of his cases as seen in photographs which he has been kind enough to send me, resemble mine very closely (figs. 1 and 2). Now the types of cretinism met with in Europe and in India are almost invariably congenital, and are not the result of a specific thyroiditis induced by a trypanosoma infection; and I find it impossible to believe that a trypanosoma infection is in itself sufficient to account for the cases recorded in Brazil. I have elsewhere [12] suggested that the so-called "chronic types" of the Brazilian disease may be forms of goitrous and cretinous degeneration upon which is superimposed a trypanosoma infection. In India all varieties of cretinous disease are constantly met with in localities where such protozoal affections as kala-azar and malaria prevail with intensity, and I venture to think that it would be as reasonable to attribute the cretinism of these localities to infections by *Leishmania* or *Hæmaphysa malariae* as to hold that the cretinism of Brazil is the result of infection by *Trypanosoma cruzi*.

But the fallacy of such reasoning is exposed by the fact that all types of cretinous disease are met with in parts of Europe and of India where parasitic thyroiditis is as unknown as are kala-azar and malaria. It is true that in localities where such protozoal infections are endemic, cases of goitrous and cretinous degeneration are often more common or more severe in type, and for the reason that almost all acute infections have a definite action on the thyroid gland. These infections, however, serve only to accentuate the congenital thyroidal inadequacy; they are not its primary cause. So important was the influence of malaria, on the production of these types of disease, regarded to be by such a competent



FIG. 1.

FIG. 2.

Fig. 1.—Cretinism (McCarrison).

Fig. 2.—Parasitic thyroiditis, nervous type (Carlos Chagas).

observer as Macnamara [10] that over thirty years ago he attributed goitre and its sequelæ to the miasma of malaria. Chagas does not claim that the chronic forms of the malady bearing his name are identical with the goitrous and cretinous degenerations of Europe, but I venture to think that he has not excluded, in a manner which leaves no room for doubt, the possibility that the form of trypanosomiasis which he has described may be an infection superimposed upon "endemic goitre," and not, as he considers the infection to be, the veritable cause of this malady in Brazil.

Since the publication of my original account of nervous cretinism a considerable number of cases of the disease have been recorded in England. In the winter of 1908 I saw, with Dr. Hawthorne, a case at the Royal Waterloo Hospital which responded readily to thyroid medication. Dr. Hawthorne has since informed me that he has met with a number of others, and obtained a considerable measure of success in their treatment by thyroid extract. In March, 1913, Dr. Langmead showed a case before this Section, and recorded the markedly beneficial results of thyroid treatment [8]. In December of the same year Dr. Crookshank showed another case before this Section which was one of six or seven under his care [3]. He also was able to record the fact that the patient, who "could hardly walk or talk seven months ago" was, as the result of thyroid medication, now able "to walk and talk well."

Typical cretinism, as described in the text-books of medicine, may be a comparatively rare affection in England, but hypothyroidism in childhood is not rare, and types of infantile palsy of all grades of severity are amongst the manifestations of this state.

PROOF THAT THE NERVOUS SYMPTOMS OF CRETINISM ARE DUE TO THYRO-PARATHYROID DEFECT.

The markedly beneficial results of treatment by thyroid medication to which some reference has been made above is, I believe, a clear indication that cases of this kind, which are not due to other obvious causes of cerebral diplegia, are often the result of thyro-parathyroid disease. Further evidence in support of this conclusion is afforded by the changes which I found in the thyroid gland in a typical case. In this patient the nervous symptoms had predominated the scene, and cretinoid signs were almost wholly wanting (fig. 1), yet the thyroid was found to be practically colloidless and to be invaded by dense bands of fibrous tissue (fig. 3); the parathyroid glands could not be found. It is certain, and the recent experimental work of Tatum [15] in very young rabbits has emphasized the fact, that "athyroidism is responsible for grave degenerative changes in practically all organs and tissues of the body, and many of the symptoms of cretinism have an anatomic basis in organic cellular changes." The experimental work of Edmunds also has an important bearing in this connexion [4]. He has shown that the changes in the central nervous system which result in animals as a consequence of thyroidectomy consist in "chromatolysis of the

cells large and small, swelling of the cell bodies, swelling of the nuclei, extrusion of the nucleus, and total destruction of the cell body, leaving only a practically free nucleus." These changes, which cannot be attributed to microbic or protozoal agencies, are, I believe, sufficient to account for the symptoms seen in "nervous" cretinism.

It is clear, then, that these being the effects of athyroidism on the central nervous system, cases of congenital thyroid defect should be recognized, and treatment undertaken, at the earliest possible moment before permanent damage has been done to the neurones. The amount

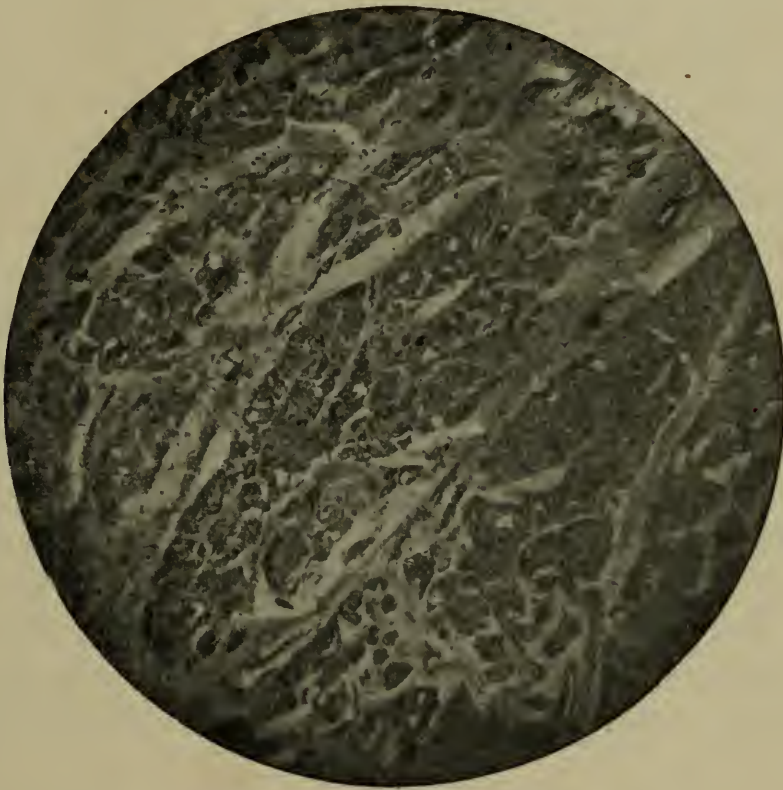


FIG. 3.

Thyroid gland of right-hand patient (fig. 1).

of benefit to be derived from thyroid medication will be dependent on the duration of the hypothyroidism, or of the athyroidism prior to the commencement of treatment.

MODE OF ORIGIN OF THE ATHYROIDISM OR HYPOTHYROIDISM.

In my original account of these cases I expressed the belief, as the result of my clinical observations, that defective thyroid function in the mother is the essential factor in the production of cretinism in the child,

and that the defect in cretinism is one of the whole thyroid mechanism of the parathyroids as well as of the thyroid gland. I was then of opinion that the diversity of symptoms met with in cretinism is due to the extent to which the defect bears on the whole or part of that mechanism. Experimental researches on rats, which I have lately published [13], confirm this opinion. A point of interest in connexion with the nervous type of the malady is the determination of the part played by parathyroid deficiency on its production. I have expressed the view that this part is possibly a considerable one [11]. But though I have lately succeeded [13] in producing definite congenital parathyroid lesions in 32 per cent. of the offspring of female rats fed during gestation on intestinal anaerobes, or on the faecal filtrate from goitrous persons, and also in producing congenital cretinism in 4·7 per cent. of cases, these young rats did not live long enough to develop symptoms which could be referred to the parathyroid glands and, consequently, I have been unable to provide definite experimental evidence in favour of this hypothesis. While I adhere to the opinion that parathyroid lesions play a part in development of the nervous symptoms associated with some cases of hypothyroidism, it appears to me that the diverse symptoms, observed in animals deprived of the whole or part of their thyroid mechanisms [16], [6], [5], and in cretins, may, in part at least, be due to the diverse nature of the toxic products of their own intestinal flora, or of their own metabolism. The harmful action of such toxins on the tissues of the body may be rendered possible by states of thyroid and of parathyroid deficiency. It is conceivable that a definite toxin may give rise to the changes which occur in the central nervous system, and that another may be responsible for the changes characteristic of myxœdema [14].

The point of practical importance, however, is the recognition of the fact that certain cases of cerebral diplegia are associated with congenital disease of the thyro-parathyroid mechanism, and that these cases can be cured or greatly relieved by the provision of thyroid substance.

PREVENTION AND TREATMENT.

Since defective thyroid function in the mother is the essential factor in the production of cretinism in the child, it becomes necessary to protect the child, during the period of gestation, from all influences which may throw an added strain on her thyroid mechanism. Of especial importance in this connexion are the effects of infectious diseases, of

helminthiasis, of intestinal toxæmia, and of fright and mental strain. All these I believe to be important determining factors in the production of cretinism in the child, and it is essential that they should be rigidly guarded against [11].

In the care of infants who may be the subjects of congenital hypothyroidism, the questions of their food and of their freedom from intestinal disorders are, to my mind, of great importance. I noted during my study of this disease in Gilgit the fact, to which I then attributed little significance, that in a small proportion of all cases in my series a definite history of defective food supply was obtained and that these were amongst the very worst cases of the disease I had met with. They were those in which, the mother's milk not being sufficient, artificial feeding had to be resorted to. We now know that human milk contains substances, probably the products of the ductless glands, which are requisite for the child's proper development. This being the case we must take the greatest care in the artificial feeding of infants to provide their milk in a form which is not defective in these important ingredients. It is questionable whether the milk of a cow is a sufficient substitute in this respect for human milk. Certain it is that the process of boiling of cow's milk destroys many of its most important constituents, and children, though abundantly fed, are thus often deprived of essential substances on which their physical and mental development largely depend. A consideration of recent work on the subject of food vitamins [7] must open our eyes to the great importance of providing artificially fed children with milk in a form which is not wanting in these essential substances, whose nature is probably closely allied to the products of the thyroid and other glands of internal secretion. It is possible that food deficient in these requisites may lead to a drain of vitamins from such tissues as the central nervous system, and thus turn the scale in favour of the development of the nervous symptoms which are present in so many cases of congenital hypothyroidism. It is rare that cases of this nature are detected in breast-fed infants till after the cessation of lactation, or till after the lapse of a period when breast-feeding should have ceased.

In connexion with the important subject of relationship of intestinal disorders to the thyroid gland I shall refer only to the influence which is exercised on this organ by intestinal parasites. Dr. S. Phillips Bedson [1], in an instructive paper published in the *Annales de l'Institut Pasteur* of Paris in August of last year, pointed out that congestion, desquamation of the vesicular epithelium, and pronounced invasion of the thyroid

gland by fibrous tissue follow as a consequence of the subcutaneous injection into guinea-pigs, over a period of from three to five weeks, of extracts prepared from the bodies of intestinal worms. It is clear that changes such as these must give rise to impairment of the organ's function. Careful search should, therefore, be made in the stools in all cases where defective thyroïdal activity is suspected for the eggs of parasites, and where these are found anthelmintic treatment should be combined with the thyroid medication.

The important influence which, as my experiments have shown, is exercised on the thyro-parathyroid mechanism by certain intestinal anaerobes [13] makes it necessary to restrain the growth of such organisms in the intestinal tract in cases of thyroïdal disease. The administration of the *Bacillus lacticus bulgaricus* or of potent intestinal antiseptics, and colon irrigations with antiseptic fluids, such as a 1 per cent. ichthyol solution, are, therefore, methods of treatment to be recommended in such cases.

It is my hope that by again directing attention to the part played by thyro-parathyroid defects in the production of a definite type of congenital palsy cases dependent on such defects may be earlier and more widely recognized, and treatment applied along the lines suggested by the nature of the underlying lesion.

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A Familial Case of Splenomegalic Anæmia with Infantilism.

By F. PARKES WEBER, M.D.

IN a paper with Dr. G. Dorner,¹ in January, 1910, on "Four Cases of Congenital Acholuric (so-called Hæmolytic) Jaundice in One Family," I suggested (after French authors) that the term "Splenomegalic Anæmia" might be used for similar cases to those which we described, if the jaundice (that is to say, obvious—*clinical*—jaundice) disappeared, though the splenomegaly and characteristic blood-features remained. Such cases of "splenomegalic anæmia" without jaundice may certainly occur (though sometimes perhaps only as temporary phases, the jaundice becoming intermittent instead of remittent) as incomplete or anomalous forms of chronic splenomegalic acholuric jaundice.² The term suggested would serve to distinguish such cases from: (a) Forms of anæmia with splenomegaly usually classified under the headings, "splenic anæmia of adults," and "Banti's disease"; and (b) cases of so-called "infantile splenic anæmia," the "anæmia pseudoleukæmica infantum" of von Jaksch. The case I am now going to describe may perhaps be regarded as an example of such "Splenomegalic Anæmia."

The patient, E. N., was just 17 years old when I showed him on June 10, 1911, at the Annual Meeting (in London) of the Association of Physicians of Great Britain and Ireland. He then looked rather anæmic, and the conjunctiva over the sclerotics of his eyes had a yellowish tinge. He certainly was small and somewhat infantile in development. In ordinary clothes and boots he measured 5 ft. 1½ in. in height, and weighed 6 st. 9 lb. His skin was very smooth and tender-looking. There was no pubic or axillary hair, and the penis and testes were very small. The spleen was enlarged and hard, reaching down into the pelvis, but nothing else was found abnormal in regard to the

¹ F. P. Weber and G. Dorner, *Lancet*, Lond., 1910, i, pp. 227-32.

² Cf. Armand-Delille and Feuillie, "Un cas d'anémie splénomégalytique avec fragilité globulaire," *Bull. et mém. Soc. méd. des Hôp. de Par.*, 1909, 3 sér., xxvii, p. 266; Armand-Delille, "L'anémie splénomégalytique, par fragilité globulaire, chez l'enfant," Association internationale de Pédiatrie (congress held at Paris in October, 1912), *Presse méd.*, Par., 1912, xx, p. 843; Chauffard and Troisier, "Des rapports de certaines anémies splénomégalytiques avec l'ictère hémolytique congénital," *Bull. et mém. Soc. méd. des Hôp. de Par.*, 1909, 3 sér., xxvii, p. 293; Chauffard, Troisier, and Girard, "Ictère polycholique aigu à la fois par hémolysinémie et par fragilité globulaire, au cours d'une anémie splénomégalytique," *Bull. et mém. Soc. méd. des Hôp. de Par.*, 1912, 3 sér., xxxiii, p. 726.

thoracic and abdominal viscera. The liver could not be felt. The superficial lymphatic glands were not enlarged, excepting very slightly (as so commonly is the case) in the groins. There was no oedema anywhere. Urine (May 29, 1911): Specific gravity 1009, slightly acid, free from albumin and sugar; Gmelin's reaction for bilirubin was negative, but the reactions for urobilin and urobilinogen were positive; the reaction for indican was negative. Blood examination (Dr. G. Dorner, May 29, 1911): Red cells, 3,481,100; white cells, 14,300 in the cubic millimetre of blood; hæmoglobin (Sahli's method), 64 per cent.; colour index, 0·9. Differential count of 500 white cells: Polymorphonuclear neutrophiles, 63·6 per cent.; small lymphocytes, 26 per cent.; large lymphocytes, 6 per cent.; large mononuclears, 0·2 per cent.; "transitionals," 1 per cent.; mast cells, 0·8 per cent.; eosinophiles, 2·4 per cent. During the count of the 500 white cells four nucleated red cells (all normoblasts) were seen. Anisocytosis and polychromatophilia of the red cells were marked; there was likewise, in a lesser degree, some poikilocytosis present. The blood platelets seemed to be of average amount.

Later, in 1911 (November), there was moderate swelling behind and below the malleoli of the right ankle. During the differential count of 500 white cells, six nucleated red cells (all normoblasts) were seen.

After 1911 I think I did not see the patient till December 15, 1913, when he was confined to bed, oedematous, and of a ghastly pale colour. The doctor who was attending him arranged for his admission to the German Hospital, but he died at home on December 24. The doctor said there was no appearance of jaundice during his final illness, but only of anæmia and dropsy. There was no necropsy.

Earlier history: The boy was born at full term with the help of instruments, and was very yellow at birth. A sallowness of complexion with slight yellowness of the sclerotics persisted. As he grew up he was subject to recurrent attacks of "depression," during which his urine became darker and he appeared yellower and suffered from lassitude and drowsiness. These attacks recurred about every three months on the average and lasted a few days. About 1908 he had several severe attacks of abdominal pain. Occasionally, on blowing his nose he noticed spots of blood on his handkerchief; but he never had regular epistaxis and never had bleeding from the gums or any other form of hæmorrhage excepting a mild attack of purpura in 1899, when he was aged 4 or 5 years. At that time, according to Dr. Porter Parkinson, who showed the patient, together with one of his sisters, at the Society

for the Study of Disease in Children,¹ his blood contained many small nucleated red cells (microblasts). His spleen was apparently first noticed to be large when he was 3 months old. He was subject to nocturnal enuresis. At 1 year of age he had had croup.

In 1908, when aged 14 years, he came under my care, and on February 12, 1909, I showed him at the Clinical Section of the Royal Society of Medicine.² In 1909 he appeared fairly well developed, but anæmic, and his sclerotics had a slight but distinct icteric tinge. The spleen was evenly enlarged and hard, reaching downwards to the anterior superior iliac spine. The liver could not be felt. The fæces were coloured. The urine was generally of rather low specific gravity, clear, pale, and free from albumin, sugar and bilirubin, but it sometimes showed excess of urobilin. The blood serum was kindly examined by Mr. L. S. Dudgeon (in November, 1908) at a time when, clinically, the jaundice was scarcely, if at all, recognizable, and was found to contain bile pigment. The thoracic organs and other parts of the body showed nothing abnormal, excepting that on one occasion a systolic murmur was heard over the mid-cardiac area, probably not due to organic disease. The fingers were not clubbed; no enlargement of the superficial lymphatic glands or of the tonsils was present; there was no pruritus or cutaneous affection. Syrup of iodide of iron seemed to do the boy good.

The blood, examined during the periods in which the boy was nearest to the normal, sometimes showed the presence of a few normoblasts. In a blood film of January 21, 1909, one of the normoblasts had a double nucleus; in another blood film of the same date one myelocyte was present in addition to several normoblasts. The red cells varied much in size ("anisocytosis") and staining ("polychromatophilia"). The average diameter of the red cells was, if anything, below the normal standard. A blood count on November 6, 1908, gave 2,800,000 red cells and 14,280 white cells to the cubic millimetre, and the differential count of white cells (kindly made by Dr. A. E. Boycott) gave: Lymphocytes, 20·6 per cent.; intermediates, 4·8 per cent.; large hyalines, 4·4 per cent.; polymorphonuclear neutrophils, 68·4 per cent.; eosinophiles, 1 per cent.; and mast cells, 0·8 per cent. No nucleated red cells were seen on that occasion. A later blood count (January 21, 1909) gave 3,140,000 red cells and 14,500 white cells to the cubic millimetre of blood. The corresponding

¹ See *Reports Soc. Study Dis. Child.*, Lond., 1906, vi, p. 8.

² *Proc. Roy. Soc. Med.*, 1909, ii (Clin. Sect.), p. 117.

differential count of 500 white cells (again kindly furnished by Dr. A. E. Boycott) gave: Lymphocytes, 20·6 per cent.; intermediates, 5·6 per cent.; large hyalines, 3·2 per cent.; polymorphonuclear neutrophiles, 66·8 per cent.; eosinophiles, 3·2 per cent.; mast cells, 0·8 per cent. During the count of 500 white cells 20 nucleated red cells were seen: 4 of these were typical normoblasts, 2 were normoblasts with budding nuclei, and 14 were nucleated red cells with polychrome cytoplasm, irregular in shape and about the size of a typical normoblast. The red cells showed much polychromatophilia and marked anisocytosis (mostly on the small side, as compared to the normal average), but hardly any poikilocytosis. At a still later blood examination (by Dr. G. Dorner, on November 15, 1909) the number of nucleated red cells was estimated at 729 in the cubic millimetre of blood, when the red cells were counted at 3,533,330 and the total white cells at 23,000 in the cubic millimetre of blood; hæmoglobin (Sahli's method), 50 per cent.; colour index, 0·7; the blood platelets were not decidedly in excess of the normal. The nucleated red cells were mostly polychromatophilic and some contained basophilic granules in their cytoplasm (punctate basophilia).

On various occasions the resistance of the erythrocytes towards hypotonic saline solutions was tested by Ribierre's method, and it was found that hæmolysis occurred when a few drops of the patient's blood, diluted with physiological saline solution, were added to a solution of between 0·40 and 0·48 parts per cent. of sodium chloride in distilled water; the "fragility" of the patient's red cells, estimated in this way by Dr. Chapuis, appeared to be slightly greater than the average in normal individuals who were used as controls. On November 25, 1908, Mr. L. S. Dudgeon kindly examined the patient's blood serum by a method described by him in the *Proceedings of the Royal Society* (Lond., 1908, Series B, lxxx, p. 531). He found that the blood serum did not exert any hæmolytic action on the red corpuscles of a healthy individual, or on the red corpuscles of the patient himself (that is to say, it had no auto-hæmolytic action); nor had the blood serum from a normal individual any hæmolytic action on the patient's red cells.

Dr. A. E. Boycott, in May, 1909, kindly estimated the boy's total blood volume by Haldane and Lorrain Smith's carbon monoxide method,¹ and reported that it exceeded the normal for the body-

¹ See Haldane and Smith, *Journ. of Phys.*, Lond., 1900, xxv, p. 331; Smith, *Trans. Path. Soc. Lond.*, 1900, li, p. 311; Smith and McKisack, *ibid.*, 1902, liii, p. 136; Douglas, *Journ. of Physiol.*, 1906, xxxiii, p. 493; Boycott and Douglas, *Journ. of Path. and Bact.*, Camb., 1909, xiii, p. 117 and p. 256, and *Guy's Hosp. Reports*, 1908, lxii, p. 157; Oerum, *Deutsch. Arch. f. klin. Med.*, Leipz., 1908, xciii, p. 356.

weight by 60 per cent. (as apparently it does in cases of chlorotic anæmia).

No Wassermann's reaction was taken in the present case, but the patient's father and mother showed no signs of syphilitic taint. The mother has had thirteen children, and no miscarriages. She said that all her children were born yellow, and remained yellow for three to six months after birth, but in the subject of the present paper yellowness or sallowness lasted more or less continuously. The eldest four children died early, the fifth, sixth, seventh, ninth, tenth, and thirteenth were reported living and healthy,¹ the eighth was the subject of the present paper; the eleventh died as a baby. The twelfth, a girl with anæmia, and splenomegaly without jaundice, died at the age of 1 year 8 months. She had been shown, together with her brother (the present case), by Dr. Porter Parkinson at the Society for the Study of Disease in Children,² and, though there was no actual jaundice, the skin was stated to have a lemon-yellow colour. Her spleen reached down to the anterior superior iliac spine, and her liver could be felt one finger's breadth below the costal margin. Her erythrocytes varied much in size (none very large) and numbered 3,393,000 to the cubic millimetre of blood. Her white corpuscles numbered 52,570, and the differential count gave: Polymorphonuclear neutrophils, 42 per cent.; eosinophils, 10 per cent.; small mononuclears, 36 per cent.; large mononuclears, 9 per cent.; myelocytes, 3 per cent.

The difficulty in the diagnosis of a case like the present one is to exclude the Gaucher type of primitive splenomegaly.³ In that disease

¹ One of these has, however (since this history was obtained), been under my care with rheumatic fever and rheumatic valvular disease of the heart.

² *Reports Soc. Study Dis. Child.*, loc. cit.

³ On the Gaucher type of splenomegaly see especially: E. Gaucher, "De l'Épithéliome primitif de la Rate," *Thèse de Par.*, 1882, and later writings by the same author; N. E. Brill, *Amer. Journ. Med. Sci.*, Philad., 1901, cxxi, p. 377; Brill, Mandlebaum, and Libman, *ibid.*, 1905, cxxix, p. 491, and 1909, cxxxvii, p. 849; F. Marchand, *Münch. med. Wochenschr.*, 1907, liv, p. 1102; F. Schlagenhauer, *Virchow's Archiv*, 1907, clxxxvii, p. 125; J. C. G. Ledingham in Allbutt and Rolleston's "System of Medicine," 1909, v, p. 766; W. Risel, *Ziegler's Beitr. z. Path. Anat. u. allg. Path.*, 1909, xlv, p. 241; P. Rettig, *Berl. klin. Wochenschr.*, 1909, xlv, p. 2046; A. Plehn, *Deutsch. med. Wochenschr.*, 1909, xxxv, p. 1749. Of still more recent articles there are especially the following: Brill and Mandlebaum, *Amer. Journ. Med. Sci.*, 1913, cxlvi, pp. 863-83; F. S. Mandlebaum, *Journ. Exper. Med.*, New York, 1912, xvi, pp. 797-821; W. A. Downes, *Med. Record*, New York, 1913, lxxxiii, p. 697 (successful splenectomy); Erdman and Moorhead, *Amer. Journ. Med. Sci.*, 1914, cxlvii, pp. 213-24 (early splenectomy); Niemann, *Berl. klin. Wochenschr.*, 1914, li, p. 277.

a yellowish or brownish tinge of the skin has sometimes been noted, as well as a tendency for two or more brothers and sisters to be affected; moreover, the presence of nucleated red cells in the circulating blood has occasionally been recorded, and a very large spleen (such as was present in the boy, E. N.) is perhaps of relatively more frequent occurrence in Gaucher's type of splenomegaly than in congenital and familial chronic acholuric jaundice (examples of which have been reported without even any clinically recognizable splenomegaly at all). On the other hand, the points against the diagnosis of the Gaucher type of splenomegaly, and in favour of the case being one of congenital acholuric jaundice, or rather of the allied condition of "splenomegalic anæmia" (see my remarks at the commencement of the paper), are practically convincing. The patient's blood contained bilirubin, and his urine was free from it. His fæces were well coloured. Examination of his red blood corpuscles (the mean diameter of which was rather below than above the normal standard for healthy individuals) showed hardly any poikilocytosis, but very marked anisocytosis, polychromatophilia, the presence of normoblasts, and a greater tendency to hæmolysis than is usual for normal individuals. Moreover, infantilism has never, as far as I am aware, been observed to accompany the Gaucher type of splenomegaly, whereas it certainly has been recorded in cases of congenital hæmolytic jaundice. Thus, Roemer recently described such a case in a child in whom the large hard spleen was removed by operation.¹

Note.—A further point against the case being one of the Gaucher type of primary splenomegaly should be mentioned—namely, the absence of the pinguecula-like thickening of the conjunctivæ, which N. E. Brill and F. S. Mandlebaum in their paper (*American Journal of Medical Science*, 1913, cxlvi, p. 863) on "Large Cell Splenomegaly (Gaucher's Disease)," claim as a characteristic feature. My attention was directed to the importance of this by Dr. H. D. Rolleston in the discussion on my paper. They write: "Early in the disease a change in the conjunctiva of both eyes may be noted. This manifests itself in a brownish-yellow, wedge-shaped thickening, affecting first the nasal side of each conjunctiva, its base being limited by the cornea. Later on the temporal side also becomes the seat of a similar thickening. The development and growth of these thickenings are very slow. . . . They resemble in some respects the lesion of the conjunctiva known as *pinguecula*. . . . We have never seen a case of the disease in which this peculiar ocular lesion was absent."

¹ See Roemer, at the Aertzlicher Verein zu Hamburg, February 17, 1914, *Berl. klin. Wochenschr.*, 1914, li, p. 669. The splenectomy was followed by immediate diminution of the jaundice and of the associated anæmia.

Fatal Hæmoptysis in a Child, aged 4 Years.

By J. D. ROLLESTON, M.D., and J. E. ROBERTSON-ROSS.

A BOY, aged 4 years, was admitted to the Grove Hospital on February 19, 1914, certified to be suffering from whooping-cough. Measles, in December, 1912, was stated to be the only previous illness, but since November, 1913, he had appeared generally unwell and had been subject to attacks of abdominal pain and vomiting.

Condition on admission: The child was in a very ill-nourished and wasted state. The cough was paroxysmal, but at no time during his stay in hospital was he heard to whoop. Rhonchi and râles could be heard all over both lungs, but no areas of dullness could be marked out. The abdomen was distended and the superficial abdominal veins were dilated. The spleen could be palpated below the level of the costal margin, and the area of liver dullness was slightly increased downwards. No enlargement of the lymphatic glands was detected.

The temperature rose nightly to between 102° and 103° F., but fell to nearly normal in the morning. The pulse-rate was rarely below 120, and the respirations varied between 30 and 50.

On March 15 a specimen of sputum was with difficulty obtained from the mouth, but no tubercle bacilli were seen. Von Pirquet's reaction, performed on April 3, was also negative, a fact which is of interest in view of the subsequent post-mortem findings. (A positive reaction, however, was found in the patient's sister, aged 2 years, who was admitted on the same day with the certificate of whooping-cough, and died on May 21 of tuberculous meningitis, a terminal episode of what was probably a generalized infection. An autopsy could not be obtained). A differential blood count on April 4 showed: Polymorphonuclears, 54 per cent.; small mononuclears, 40 per cent.; large mononuclears, 6 per cent.

Very little change occurred in the child's general condition, but on April 13 impairment of resonance was noted below the left ninth rib behind and extending round into the left axilla; over this area the breathing was bronchial in character.

During the evening of April 24 a very little blood-stained sputum was expectorated, and at 8.30 p.m. on April 25, after a comfortable day during which the child had seemed rather brighter than usual, a sudden copious hæmoptysis occurred, death ensuing almost immediately.

Necropsy (April 26): On pressing on the trachea and œsophagus a quantity of dark blood was expelled from the mouth and nostrils. The tracheo-bronchial glands were much enlarged, obviously tuberculous, and some of them caseating. The left pleura was thickened and firmly adherent to the chest wall and diaphragm. The upper lobe of the left lung was studded with tuberculous deposits. The lower lobe was solid, small pieces of it sinking in water, and presented a cavity about the size of a walnut, completely filled with recent blood-clot. The whole of the right lung was a mass of tuberculous nodules. The liver was enlarged, fatty, and studded with tubercles. The spleen was considerably enlarged and contained tuberculous deposits of a fair size. Tubercles were also seen in the kidneys, basal meninges and grey matter of the cerebral cortex. The heart was empty and normal in size and appearance. The mesenteric glands were enlarged and the stomach contained a large quantity of altered blood, but showed no sign of any lesion in the mucous membrane.

This case is of interest in the first place as being an example of general tuberculosis with the primary focus in the tracheo-bronchial glands producing a paroxysmal cough simulating whooping-cough; and in the second place owing to the rarity of hæmoptysis in so young a child. Although, as in seven out of twenty-three cases collected by Meusnier which came to autopsy, the actual bleeding vessel was not definitely identified, it is presumable that the hæmoptysis occurred through the rupture of a branch of the pulmonary artery into the cavity found in the left lower lobe. Death was ascribed to asphyxiation rather than to the amount of blood lost.

A somewhat similar case occurred at the same hospital nearly three years previously. A boy, aged 4 years, was admitted with the certificate of whooping-cough on June 8, 1911. His cough was sometimes paroxysmal, but no whoop occurred during his six months' stay in hospital. The signs and symptoms were those of chronic pulmonary tuberculosis, and the paroxysmal cough suggested affection of the tracheo-bronchial glands. Von Pirquet's reaction performed on July 19 was positive. Two attacks of profuse hæmoptysis occurred on December 20, and death took place the same day. No autopsy could be obtained.

Meusnier, in 1892, collected thirty-three cases of hæmoptysis in children aged from 8 days to 14 years, but only sixteen of these were in children under 5 years. Of these sixteen all but three were tuberculous and all but one—a case of influenzal bronchitis—were fatal. The other

two non-tuberculous cases occurred in new-born infants, in one of whom the lungs seem to have been digested by the inspiration of gastric juice during vomiting, while in the other the hæmoptysis was due to pulmonary thrombosis of syphilitic origin. Magruder, in 1908, described a case in a negro boy, aged 3 years, very similar to our own, and referred to four other cases aged from 7 months to 3½ years in which fatal hæmoptysis was due to pulmonary tuberculosis. Other cases of fatal hæmoptysis in children due to pulmonary tuberculosis have since been reported by Brown in a girl aged 3 years, and by Thomas in an infant aged 3 months.

It would thus appear that hæmoptysis occurring in young children is in the majority of cases due to pulmonary tuberculosis. It is, as a rule, a sudden and fatal event. In only five of Meusnier's twenty-nine fatal cases had the terminal hæmoptysis been preceded by any spitting of blood. In this respect the slight premonitory hæmoptysis which occurred in our case was exceptional.

The hæmorrhage may be caused by the rupture of an aneurysm or of a branch of the pulmonary artery into a cavity within the lung, either in the apex or the base, or by the breaking down of tracheo-bronchial glands surrounding a vessel and causing a rupture into a neighbouring bronchus. The fact that the mouth, pharynx and lower air passages are as a rule filled with blood, demonstrates the mode of death in these cases. The stomach is generally found to contain much blood, suggesting at first sight hæmatemesis, but no lesions can be detected in the mucous membrane. Other causes of fatal hæmoptysis in children besides tuberculosis may be gangrene of the lung, ulceration of the neck vessels in scarlet fever or gangrenous angina, or hæmorrhage in ulcerative sore throat, an example of which was reported by one of us to this Section during the last session.

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DISCUSSION.

Dr. G. A. SUTHERLAND said he understood that the case was sent into the hospital as one of whooping-cough, and that a few days later another member of the same family was also sent in with the same diagnosis, and that both patients died of general tuberculosis. Though probably all had, at some time or other, diagnosed as whooping-cough the cough produced by the pressure of tuberculous glands on the bronchi, to have two cases mistaken for this disease in the same family so near together as to date was most unusual. Fatal hæmoptysis, as Dr. Rolleston had pointed out, was rare in children; he could not at the moment recall a case in a child.

Dr. J. D. ROLLESTON, in reply, agreed with Dr. Sutherland that it was remarkable that two children from the same family should have been sent in at the same time with an erroneous diagnosis. They had a cough resembling pertussis, but there was no doubt that they were not suffering from whooping-cough.

Section for the Study of Disease in Children.

June 6, 1914.¹

Dr. LEONARD G. GUTHRIE, President of the Section, in the Chair.

"Siamese" Twins.

Exhibited by C. GREY-EDWARDS, M.D.

ON June 6 I was called to attend a Mrs. E. in her third confinement. As she had been in labour a long time before I saw her and was making no progress, I endeavoured to put on the forceps, but found it was impossible to close them, so I then called in Dr. A. Tuthill to help me, and he was also unable to use the forceps. We then determined to turn, and, after much trouble, I managed to bring down a leg and then Dr. Tuthill was able to deliver. The twins were attached to each other by the side of the head and were well developed. The House Surgeon at the Victoria Hospital, Bournemouth, who made a post-mortem, says that the union was a bony one and that the brains were quite separate. One twin lived twelve hours and the other eighteen.

Case of Tumour, for Diagnosis.

By F. C. BOTTOMLEY, M.D.

THE exhibitor first saw the child, then aged $2\frac{1}{2}$ years, in December, 1912, when it had pain in the abdomen and was constantly crying. The legs could not be moved, and a lump was felt in the right loin, which had persisted, though the legs had regained some power. Still, the anterior tibials and the calf muscles did not act at all. There was incontinence of both urine and fæces. The Wassermann test was negative, and he considered that sarcoma was excluded because the child had improved

¹ Provincial meeting held at the Royal Victoria Hospital, Bournemouth.

and put on flesh. Tubercle he excluded by putting in a needle and not finding pus. He hesitated between a bony tumour involving the spine and tubercular disease. If it had been the latter, one would have expected angular curvature by now. He believed it to be a bony tumour of the spine.

DISCUSSION.

Dr. HUGH THURSFIELD said he was not able to feel a tumour. He felt a prominence, which seemed to be the lumbar spine pushed forward by the arching of the child's back. The child's spine was also slightly curved to the right, which would produce a bony prominence more on the right side than on the left. Secondly, he failed to see that a bony tumour would explain the phenomena seen in the legs. The child had flaccid palsy even after one and a half years' duration of symptoms, and he thought that a tumour pressing on the spinal cord would have caused much more rigidity and spasm. The history strongly suggested anterior poliomyelitis, and, so far as the thighs and legs were concerned, he saw no objection to that suggestion. The difficulty was that incontinence of urine and fæces was a rare phenomenon in anterior poliomyelitis, and in the curvature of the back, which he did not remember to have seen so extreme in that condition. But one saw most extraordinary alterations in the back and other bony structures as a result of muscular palsies due to anterior poliomyelitis. He did not know whether the spine had been radiographed; it would be most interesting to see the condition of the spinal column.

Mr. BURROWS thought tuberculosis would explain the child's whole condition. At the age of 10 months the child persistently cried with pain. He could feel a lump on the right side which might well be a psoas abscess which had become thickened and calcified. The spine was rigid. The incontinence of urine and fæces, and the flaccid paralysis, he thought, could be well explained by pressure on the lumbar enlargement of the spinal cord.

The PRESIDENT (Dr. Leonard Guthrie) was inclined to regard the condition as due to local pressure. The condition of the lower limbs reminded him of what occurred in spina bifida occulta. To his mind it was too symmetrical to be attributable to poliomyelitis, affecting, as it did, muscles on both sides below the knee. He agreed with Dr. Thursfield that an X-ray examination might throw some light on the condition. He believed the symptoms were due to implication of the lower part of the lumbar cord, or cauda equina.

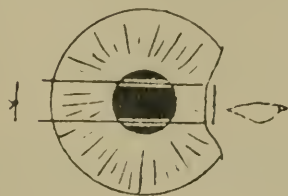
Dr. BOTTOMLEY said he certainly thought there was a lump because he had consistently felt one for one and a half years. He would, as suggested, have the area skiagraphed.

Note.—X-rays have shown a mass of bone to be present, and an operation has been performed with a view to relieving pressure on the cord.

Wound of the Ciliary Body, with threatening of Sympathetic Ophthalmitis.

Exhibited by E. E. MADDOX, M.D.

THE eye was pierced with a broken cane. Cured by thermo-cautery



The spindle-shaped wound of the ciliary body is seen shining through the conjunctiva drawn over it and held by a thread attached beyond the opposite limbus for a week.

and a flap drawn over by super-corneal sutures. To illustrate the use of the exhibitor's super-corneal sutures.

Two Cases of Paralysis of the Cervical Sympathetic following Delivery by Forceps.

By HAROLD BURROWS, F.R.C.S.

Case I.—Mrs. S. has enophthalmos, ptosis and contracted pupil in left eye which, she says, dates from birth. The labour was difficult and instruments were used.

Case II.—W. J., aged 14 months. The birth was difficult and instruments were used. For a few days following birth the left eye was closed by swelling of the lids. The mother says the baby had a "black eye," and that when the lids were opened on the third day some blood escaped. The child now has enophthalmos, ptosis and contraction of the pupil of the left eye. The left pupil does not dilate when cocaine is dropped into the eye.

Mr. BURROWS said that in both cases there was a history of difficult labour, forceps being necessary. The paralysis might be due to pressure by forceps exerted on the neck beneath the mastoid process, in the same situation as when the facial nerve was paralysed and the sternomastoid lacerated in delivery, or there might have been a local injury to the ocular sympathetic in the orbit. Against the idea of a neck injury was the fact that the cervical sympathetic was deeply situated, though it was not so well protected from

trauma in a child as in the adult. In one of the cases the mother said the child was born with a black eye, and when the eye was opened two or three days later some blood came out. He did not see how the forceps could have injured the ocular sympathetic through pressure on the eyeball; at the same time it was significant that there had been no laceration of the sternomastoid and no facial paralysis. Under cocaine the pupil on the sound side dilated, but not on the paralysed side. In each of the two cases there was a small pupil, ptosis, and enophthalmos, but in neither case could he get a history of flushing or sweating more on one side of the face and neck than on the other. He asked whether others had seen similar cases.

Congenital Dislocation of Right Humerus.

By HAROLD BURROWS, F.R.C.S.

FOR permission to bring forward this and the following case I am indebted to Surgeon A. V. L. Richardson, R.N.



Skiagram of congenital dislocation of shoulder. (Taken by Staff-Surgeon A. J. Smith Shand, R.N.).

V. J., aged 11 years. So far as can be gathered the birth was a normal one. The abnormality was noticed shortly after birth, but was regarded as "a birth paralysis." There is considerable limitation of movement with wasting of the shoulder muscles, while there is marked inward rotation of the arm.

Congenital Dislocation of Right Radius.

By HAROLD BURROWS, F.R.C.S.

J. C., AGED 7 years. Birth was by breech presentation, and labour was difficult. Abnormality of the right arm was observed shortly after birth, but was attributed to "birth paralysis," and the mother was assured that it would right itself in time.

DISCUSSION.

Mr. BURROWS said that in the case of dislocated humerus labour had been normal; but in the living child, by hooking the finger into the axilla to deliver the shoulder it was conceivable that there might be produced a subspinous dislocation of the humerus. There was no evidence as to whether these congenital dislocations were produced by trauma at birth, or whether they were congenital, in the same sense as congenital displacements of the hip, independently of trauma at birth. There was very limited power of external rotation of the arm. He asked what was the best thing to do for the case. There was a curious deformity of the clavicle, which he had not noticed until Mr. Philip Turner pointed it out. He had only just seen the skiagram of the case. This deformity was a sigmoid curve of the outer part of the clavicle.

In the second case the child was born with a breech presentation, and possibly the deformity was caused at birth in bringing down the arm. There was but slight alteration in the ends of the humerus and radius, whereas the articular surfaces were not usually so little altered in congenital dislocations. In this case the head of the radius was displaced forwards.

Dr. MAHOMED said there appeared to be a long spur developed in the coracoid process. He did not know whether it was an attempt of Nature to compensate for the dislocation, and to make a new cup for the humerus; he thought there was some injury to the epiphysis, and that this accounted for the wasting of the head of the bone. He did not know that any operation was likely to restore the atrophied condition existing. The only operation he would recommend was removal of the spur in the hope of securing a larger range of movement. In the second case, the dislocation of the radius forward did not seem to account for the wasting in the arm. The child could not put either hand to its head very well. He thought it was more a case of failure of development than dislocation.

Dr. CHARLES W. CHAPMAN directed the attention of members to the current number of the *Practitioner*, in which appeared a description of cases of shoulder difficulty, with X-ray pictures, in some of which there was a bursa under the acromion. One of them was similar to that of one of the children now shown.

Mr. PHILIP TURNER said he remembered seeing a case of congenital dislocation of the shoulder many years ago, but did not remember the exact details of it. The head of the humerus was displaced, but he believed there were no other deformities. In the present case, in addition to the displacement of the head of the humerus there was a curious bending downwards of the outer end of the clavicle, and a bony spur seemed to be continued from this some distance downwards into the muscles of the arm; there was also considerable narrowing of the shoulder on that side. Roughly, the measurement from the acromion process to the suprasternal notch on the affected side was an inch less than on the other; there was much muscular wasting, which he attributed to disuse. The scapula was smaller than its fellow. There were so many things to be taken into account in considering means of getting further movement, that it made one doubtful whether operation would improve the condition. With regard to the case of dislocated radius, he agreed with Dr. Mahomed that the displacement of the radius did not account for the disability in raising the arm and moving the shoulder; he thought there must be some actual paralysis of muscles.

The PRESIDENT, referring to the cases of paralysis of the sympathetic, asked Mr. Burrows whether it would not be more correct to describe them as paralysis of the ocular sympathetic, rather than of the cervical, seeing that there appeared to be no evidence—and he did not gather any himself—of unilateral flushing, or sweating, or pallor. In one case, the history of a black eye and the discharge of blood seemed to show that it was an ocular traumatic condition. Why the sympathetic should have been picked out and no other ocular muscles he could not explain.

Dr. LANGMEAD, referring to the case of sympathetic ocular paralysis, said that there was a group of cases in which congenital paralysis or absence of sympathetic control over the eye occurred. He knew of a family group of cases of that kind. In the members of this family there was evidence of paralysis of the cervical sympathetic in the neck, for flushing of the face and sweating were unilateral. The iris on the side on which the sympathetic was affected was not pigmented, an interesting point which might bear on the relation between the pigmentation of Addison's disease and affection of the sympathetic nerve ganglia. In the present case, however, there was no want of pigment in the iris. It was difficult to see how pressure on the eyeball would cause such a condition as that found.

Dr. LEON asked why Mr. Burrows called his first case dislocation of the humerus. He agreed with Dr. Mahomed that it was injury or malformation of the epiphysis, with consequent abnormality of the bones of the shoulder.

Mr. BURROWS replied that in the case of sympathetic paralysis there was only evidence of ocular sympathetic paralysis, not of the whole cervical sympathetic. It was difficult to imagine any injury to the eyeball which could have caused the condition. Yet there was no evidence of paralysis of the sympathetic of the face or neck. In the case of the dislocation of the humerus, the skiagram was taken from before backwards, and therefore did not show much displacement, but he believed the lesion to be a subspinous dislocation. The operation he had in mind was excision of the head of the humerus, to allow of free external rotation to enable the hand to be brought into action. In the case of dislocation of the radius the difficulty in raising the hand to the head pointed to some myopathy.

The PRESIDENT further observed that in cases of paralysis of the cervical sympathetic it was not uncommon for the facial and cervical symptoms to disappear whilst the ocular remained, and it was possible that in earlier life there might have been evidence of unilateral sweating or redness, which cleared off after a time, leaving the ocular sympathetic still affected. He agreed that it was difficult to attribute it to traumatism in the eyeball, seeing that no other ocular paralyses were present.

Case of Tuberculosis treated by Trypsin.

By E. CURTIN, M.D.

THE patient, a child, aged 4 years, had tubercular abscesses all over the body, and large fungating ones about the ankle, which were raised $\frac{1}{3}$ in. above the surface, and about the size of a crown piece. Eighteen months ago he tried conservative treatment, the cautery, glycerine, iodoform, &c., but with no result. In the *Practitioner* he saw an article on treatment by trypsin, by Dr. Baetzner, and an illustration of a case like the present one. He started the treatment. Its effect on the discharge of pus and on the ulcers generally was almost immediate. The child was chloroformed for the séance, and fifteen treatments had been applied. Owing to the tardy recovery from the chloroform, which made him fear there might be status lymphaticus, he had not pursued the treatment as much as he otherwise would have done. He had not noticed any constitutional symptoms following the use of the trypsin. The injections were made into fairly healthy tissue surrounding the ulcer. When scar tissue developed, considerable force was required to get the substance into the tissue, and there was corresponding pain, but it was quite local. There seemed to be no effect exerted by the trypsin on the bone. A recent development in this child was dactylitis, which

had been treated with X-rays, but with a negative result. Concentrated sunlight seemed to have had a good effect on the ulcers. He thought one of the tarsal bones was necrosed. Trypsin seemed to have no effect on the bacteria themselves, but on the tuberculous cells and debris. He had not used tuberculin for four or five years.

Case of Pseudo-hypertrophic Paralysis.

By J. T. LEON, M.D.

THE exhibitor said he only saw the child two or three days ago, when he was brought to hospital by his father because of pain in the back and deformity. For twelve months the child had been unable to walk any distance, and occasionally fell down. The age was 8 years. A brother, aged $4\frac{1}{2}$ years, walked with a similar gait. The condition was much more common in boys than in girls. When he began to study medicine pseudo-hypertrophic paralysis was considered an entity, and the facio-scapulo-humeral type was considered to be another. But they were both included now under the term "myopathies." There was in this case marked wasting of the lower part of the pectoral and the latissimus dorsi, with hypertrophy of calf muscles and deltoid.

DISCUSSION.

Dr. LANGMEAD agreed that it was now generally recognized that all myopathies overlapped, and that the various types showed features belonging to each other. He raised the question of prognosis in such cases. The course of the disease varied widely. Some cases terminated within a few years of the onset, others were stationary for long periods and continued for many years. He had seen one case, that of an adult aged 45 years, in which there had been no noteworthy progress in ten years. He did not know of any means of forecasting which cases would run a long course, and which a short one.

The PRESIDENT said that, in his experience, the cases of the disease which began in early childhood tended to progress, so that if they survived to their twentieth year they were bedridden and helpless, with contracted muscles. There was another form which came among the myopathies—namely, Oppenheim's amyotonia congenita; it was a strictly congenital form—i.e., children were actually born with the wasting of extremities. Opinion was now agreed that it was a congenital myopathy.

Dr. LEON replied that Dr. F. E. Batten, an acknowledged authority on the disease, said that the prognosis was worse in the pseudo-hypertrophic type

than in the others, and that was his own view based on the few cases he had seen. The pseudo-hypertrophic type, when they could not walk, rapidly went downhill, and an intercurrent disease carried them off. He, however, had seen a girl who had had the disease eight years; she was in a perambulator chair, and said she felt well.

Case of Asthma.

By W. J. MIDELTON.

V. G., AGED 5 years.

Family history: Father suffers with rheumatism, mother has had asthma all her life.

Previous history: Born healthy. At the age of 3 months, diarrhoea and vomiting. Vaccinated at the age of 4 months; came out in a fine rash all over. Eczema persisted extensively for a long time, weeping and scabs. Never entirely cleared up. Three years ago double pneumonia, seriously ill a week; since then has had asthma more or less. Has periodical attacks, pneumonic in character. Measles six weeks ago, "did not come out well."

History of present illness: First seen by me on May 19 last. Child was then suffering from cough, dyspnoea, cyanosis, loss of appetite, dullness and râles over the bases of lungs, and wheezing over the front of chest. Painted chest, front and back, with "pyonex oil." May 20: Blisters on upper part of chest, front and back, also a general eruption resembling measles. May 21 and 22: Child very ill, dyspnoea increased; patient semi-conscious, respirations rapid, pulse about 150, sordes on lips. May 23 and 24: Condition gradually improved. May 25: Patient out of danger, breathing quietly, taking food well. May 26: Slight relapse; application to abdomen. Patient has steadily improved.

DISCUSSION.

Dr. MIDELTON added that he thought the eruption must have been dermatitis herpetiformis, which varied a good deal in its manifestations, from erythema to bullæ with scabs following.

Dr. CAROLIN asked how Dr. Middleton accounted for the dullness of the percussion note all over the patient's back.

Dr. MIDELTON replied that the cantharides, in his hands, seldom produced any effect on the kidneys, though he had been using it for fourteen years. He thought that danger had been much exaggerated. In fact, he produced large

blisters in some cases and did not worry about the kidneys as a rule; he had even carried out the treatment in certain albuminuric cases and they had got better. In answer to the remark of Dr. Carolin, the condition had not yet quite cleared up, and the child had had constant attacks of what was termed pneumonia, though the pneumococcus had not been looked for. What was heard was the result of the successive thickenings.

Note.—July 20, 1914: A careful search for tubercle bacilli in the sputum by an expert, recently, proved negative. The child has gained weight steadily, has had no asthma since the acute attack described above, and is better in every way.

A Case of Mongolism, with Alopecia.

By W. J. MIDELTON.

L. F., AGED 6 years. September 30, 1912. Last of five children. Family history *nil*. Father, mother, brothers and sisters strong and healthy. Mongolian imbecile from birth. Bronchitis at the age of 4 years, none since. Began to say a few words at the age of 4 years; can say a good many now, but speaks indistinctly. Is growing and is very strong. Has been in Bournemouth since April and has greatly improved in that time. Gait scuffling. Height, 3 ft. 2½ in.; weight, 2 st. 9½ lb. Blepharitis, especially right; has suffered from birth. Large patch of alopecia areata on left side and at back; hair falls out readily and scalp tender. "Pyonex" treatment; thyroid extract, $\frac{5}{8}$ gr. nocte.

November 12: Improving; hair growing on patches; does not fall out so much; scalp less tender.

January 27, 1913: Vocabulary increasing rapidly, hums tunes; gait less shuffling.

April 16, 1913: Eyes better; improvement maintained.

July 19, 1914: Improvement maintained, more intelligent, and vocabulary much increased.

DISCUSSION.

Dr. MIDELTON said he painted the area of alopecia with croton oil and cantharides, and the hair began to grow again; and when he stopped the treatment it fell out again.

Dr. CHARLES W. CHAPMAN said he understood that thyroid was also given to this child, and that would account for the hair growing again.

Dr. SIDNEY GILFORD referred to an infant which died at the age of 14 days of convulsions and was undoubtedly a "mongol." The mother went to the seaside last August and had a very severe flooding. It was thought to be a miscarriage, but the child was born at practically full term. Perhaps the hæmorrhage had so exhausted her energies that the "mongolian" child was the result.

Dr. LANGMEAD, whilst agreeing with the diagnosis, pointed out that this child had not the small button-like nose found usually in "mongols," but had a nasal organ of more than average size. He thought that there were two or three factors producing weakness of the procreative force, which led to "mongolism." Such a child might be born (1) at the end of a large family, or (2) when the mother was well on in years, or (3) to a mother who had given birth to children in rapid succession. The mother of one "mongol" child he saw had had twins on two occasions, and after giving birth to four children as rapidly as was possible, her fifth was a "mongol." (4) Sometimes the mother was found to have been in poor health during gestation. One or more of these factors was usually present, but he acknowledged that exceptionally a "mongol" child might be the first-born and the offspring of apparently healthy parents.

The PRESIDENT said he had seen a typical "mongol" child of parents who were both under 27 years of age. He once went fully into this matter, but was unable to make any dependable generalizations at all. In some cases the child was the end of a large family, in other cases not; in some cases both parents were beyond the usual age for marrying, in some the "mongol" was the first child. In others it came in the middle.

Dr. CHARLES W. CHAPMAN reminded members of a case he spoke about in the old Society, of a wealthy couple he knew who had three or four healthy children, and then the mother determined she would not have any more. When she found she was pregnant she tried to solicit his aid, but he would have none of it, and she said she had taken drugs, and intended to go to Paris. She went under treatment, but the child was born, and was a miserable "mongolian" specimen. Dr. Shuttleworth said he knew of similar cases, where such children were born after early attempts to procure abortion. He feared such attempts were even commoner now than eight years ago.

Dr. THURSFIELD said he was pleased to hear the President's remarks, because he believed too much stress was laid upon the exhaustion of the reproductive faculty in women. He agreed with the President that it was not unusual to find the first child of healthy young people a "mongol," and it was not uncommon for such children to be born to syphilitic parents. The phrase as to the limit of the reproductive capacity had no real meaning, and he would like "mongolism" to be recognized as a disease of ante-natal life, not necessarily a primary disease of the ovum; the root of the trouble might reside in the father, for all that was known at present.

Discussion on Status Lymphaticus.

Opened by HUGH THURSFIELD, M.D.

IN 1905 the Society for the Study of Disease in Children devoted a sitting to the discussion of the causes of sudden death in children [10], and among other phenomena gave consideration to the subject of our discussion this afternoon. In the intervening nine years the literature upon status lymphaticus has grown to alarming proportions, and every year adds an increasing number of communications. But in spite of this fact I am afraid that our absolute knowledge of the condition remains almost as small as then, though I think that the limits of our knowledge are better defined and that there is less tendency to stray into somewhat vague speculation.

I must first recall to your recollection the facts which led up to the formulation of the conception of a constitutional disorder called "status lymphaticus." Away back in the seventeenth and eighteenth centuries our predecessors had recognized that there occurred deaths which could be attributed to the pressure of a large thymus gland upon the vital structures contained in the upper aperture of the thorax. It is probable that the earliest recorded cases were examples of malignant disease of the gland, but in the nineteenth century it was recognized that there were a group of cases of dyspnoea terminating with sudden and unexpected death in which the only anatomical morbid lesion was the presence of an abnormally large thymus. In 1850 Friedleben, after a detailed research into the anatomy of the gland, came to the conclusion that there was no such thing as thymic asthma. That this dogma, like most dogmatic statements on controverted questions, was exaggerated, is, I think, now quite clear; but it cleared the ground for the conception formulated by Paltauf in 1889 of a constitutional disorder manifested by a hypertrophy of all the lymphatic structures of the body including the thymus gland: a condition to which he gave the name of "status lymphaticus." The features upon which he laid stress were the enlargement of the thymus gland, the hypertrophy of the tonsils and the lymphatic tissues of the nasopharynx, the enlargement of the lymphoid tissue at the root of the tongue, the hypertrophy of the Peyer's patches and solitary follicles of the intestine, the large spleen; and to these he added the hypoplasia of the aorta, a feature

which has been seldom observed since. Such abnormalities he held to be the outward expression of a constitutional disease which rendered its possessors peculiarly liable to infection and to sudden failure of the vital functions.

Paltauf's hypothesis has had vigorous critics and valorous supporters; both, if I may venture my own opinion, indiscriminating and indiscreet. But we are to-day in a better position than in the discussion of 1905 as regards the knowledge of the normal anatomy of the thymus gland. Then it was commonly stated that the gland reached its maximum size in the last months of foetal life and during the first two years of infancy; and that after this date it rapidly atrophied. Even now, however, it remains a disputed point what is a normal weight for the gland at any given period. In a paper which I wrote [11] in 1902 I gave reasons for believing that the normal weight during the period of infancy had been considerably exaggerated, and Dudgeon [2] in 1905 came independently to the same conclusion. We considered that any thymus gland which exceeded 10 to 12 gm. during the first two years of life must be considered abnormal. I must, however, add that some of the German authorities put the normal weight much higher, at 25 gm., and that one of the more recent text-books of anatomy in this country states that the gland at puberty maybe merely remains, or may weigh as much as 40 gm. Morbid anatomical experience, however, at least in this country, does not agree with these statements, and it is exceptional to find a thymus gland of more than 10 gm. except in connexion with the conditions I am about to mention.

Friedleben in 1850 maintained: "*Es gibt kein Asthma thymicum.*" It now, however, seems to be generally agreed that he made a mistake, and that there are cases of dyspnœa which are directly attributable to the pressure of the enlarged thymus. For example, Klose [6], writing in 1911, was able to bring forward nineteen cases in which the excision of the whole or a part of the thymus had relieved the dyspnœa; in another case the dyspnœa persisted, and in three others the operation was fatal. He came to the conclusion that the cause of such dyspnœa was pressure by the enlarged gland and that all such cases "belong to the surgeon." Parker, an American author [8], in 1913, collected fifty cases in which operation had been performed for the relief of dyspnœa. The mortality of the operation was considerable (seventeen deaths, 33·3 per cent.), but the deaths were seldom to be attributed to the operation. It should, however, be noted that in thirteen of these seventeen cases there was infection either of the wound or of the lungs.

Even if we take only the cases recorded since the beginning of 1910, nine out of twenty-three patients were dead within a month of the operation, while of the recoveries one required a second operation six months after the first; the relief from the dyspnœa was generally gradual and not immediate, though in about half the cases the acute attacks of suffocation disappeared at once. My own experience is that these cases of so-called thymic dyspnœa are extremely rare. I have been on the look-out for such cases for many years, and I have asked many friends of greater experience than mine, but with one exception I have yet to meet with symptoms at all suggesting the condition. This case was that of a baby, aged 5 months, who had a history of making gurgling noises since birth and of becoming very blue when he cried. He had some inspiratory and expiratory stridor and some dilatation of the veins of the neck and cyanosis when he cried, but no recession of the chest walls and no bulging tumour in the episternal notch. On examination he had an area of impaired resonance over the manubrium sterni, and for a distance of about $\frac{1}{2}$ in. on either side the dullness was continuous with the heart dullness. An X-ray picture showed an opaque shadow coincident with the dull area, such as might be caused by a bulky thymus gland. Intubation of the larynx did not relieve the stridor. Thymectomy was discussed, but before a decision was made a reddened area appeared above the inner end of the right clavicle, and an abscess was opened, in connexion presumably with the deep lymphatic glands, with complete relief of the dyspnœa. The cavity of the abscess extended backwards to the vertebræ, and the trachea was displaced to the left side.

My own opinion is that in many of these cases of dyspnœa the thymus is not responsible for the pressure, but that, as in this case, the real source is the enlargement of deep glands. And I must add that in the records of the fatal cases following operation there is no statement of the condition of the lymphatic apparatus elsewhere in the body; that is, there is no attempt to establish the diagnosis of lymphatism, while in several of these the tracheo-bronchial glands are described as necrotic.

But, whatever may be our opinion about these dyspnœic cases, there can be no doubt that pressure plays no part in the cases which I am next going to consider, the sudden deaths, whether in infants who have given no previous signs of disease, or in those who are suffering from some trivial disorder, or, again, in patients who expire without warning under an anæsthetic. It is a common experience of the post-mortem

room to make an examination of the body of a baby who has been found dead without any previous illness, and in the bulk of these the morbid anatomy is constant—an enlarged thymus, usually between 25 and 35 grm., bulky and thick, often covered with small petechial hæmorrhages, a hypertrophy of the Peyer's patches and of the solitary follicles of the intestine, and an enlargement of the mesenteric, bronchial and cervical glands. It has been maintained that such cases also are due to the pressure of the thymus upon the vital structures. The hypothesis takes various shapes, sometimes that the pressure is exercised on the trachea, and that this becomes flattened, but it has been shown that an elliptical shape is not uncommon in the normal child. Then, that the pressure is exercised on the great vessels, but there is no sign of engorgement of the organs such as would accompany such pressure, and often the heart is empty and firmly contracted. Lastly, that the pressure acts upon the vagi and inhibits the heart's action. I was some years ago an eye-witness of such a death. . . A boy, aged 13 months, "suddenly sat up, his eyes became fixed, he ceased to breathe, became very slightly blue, and then quite white, and fell back dead. The whole series of events occupied less than thirty seconds." Such a manner of death does not suggest pressure. Bellamy Gardner's experience [4] with a boy, aged 13 years, who was under chloroform, was very similar. The patient, just after the operation had been begun, "made a slight retching movement . . . stopped breathing . . . a deep navy-blue coloration appeared on the forehead and temples . . . the lips and ears were at the same time almost normal in colour . . . From the moment of respiratory paralysis not one single natural muscular or respiratory movement took place." In both these cases the autopsy showed the presence of the classical signs of status lymphaticus, and the complete absence of any signs of obstruction to the respiratory passages, and, further, the absence of any signs of pressure upon the great veins of the neck. If pressure be the cause of death, it appears to me that it is inconceivable that the great veins and the sinuses of the brain should show no sign of dilatation and congestion. Before leaving these cases I must add that such "anæsthetic" deaths are, in a very large number of instances, due to the existence of this mysterious condition. Spilsbury [9], who has had an unusually wide experience, has stated that the majority of sudden deaths during anæsthesia which he has had to investigate were associated with the presence of status lymphaticus. Nor do they occur with chloroform alone. Of thirty such cases McCardie [7] found that in seventeen the anæsthetic was chloroform,

in six ether alone was used, and in five others a mixture of ether and chloroform. Further, in two cases local anæsthesia had been employed, in one cocaine, in the other Schleich's infiltration method. Nor is the death due to the shock of the operation, for in more than one instance the operation had not been begun. Lastly, in several the patients had been safely anæsthetized, the operation had been completed, and the patient back in bed had recovered consciousness, and then when all seemed safe suddenly death had supervened. Such deaths are quite unlike the so-called "delayed chloroform poisoning," in which condition there is seldom any suddenness in the fatal issue, but profound collapse with vomiting and acetonæmia fill a more or less prolonged interval.

Besides these two well-recognized groups some writers have found evidence of status lymphaticus in sudden death occurring in the course of certain diseases which do not usually lead to a fatal issue. The most striking of these is the sudden death which occasionally occurs in the eczematous conditions of infants. Feer [3] in 1904 was able to collect thirteen cases of death during eczema, and in ten of these there was an enlarged thymus and hypertrophy of the lymphatic structures. He does not contend that all deaths in eczema are associated with this condition, since some are undoubtedly due to an acute infection. It is interesting in this connexion to recall that Gardner's patient had suffered from obstinate eczema before his death.

Some authors have also maintained that a status lymphaticus is often found in men who have committed suicide, but this is certainly not a common experience.

Of other diseases in which it is common to find an enlarged thymus I will merely mention myasthenia gravis, a disease which sometimes ends in attacks of dyspnœa and respiratory failure, Addison's disease, and leukæmia. In these two last the enlargement of the gland is by no means common. A more important association is that with Graves's disease. Here it is rare for an autopsy to be performed without finding a considerable enlargement of the thymus. Capelle [1] found that of twenty-two cases of exophthalmic goitre dying under an anæsthetic twenty-one had an enlarged thymus gland. Although the other signs of the lymphatic state are often not marked, it is probably to the co-existence of this condition that we must attribute the well-known danger of general anæsthesia in Graves's disease. At the same time I do not think that apart from anæsthesia sudden death is common in this affection.

THE ORIGIN OF THE LYMPHATIC STATE.

When we pass from the consideration of the manifestations of lymphatism to that of the origin of the condition we pass into a region of vague speculation where very little is known, and that little very inaccurately. In recent years Basch, and later Klose [6], have conducted a series of thymectomies on puppies, and though it can hardly be said that these experiments throw much light on the lymphatic state, they do at least widen our conception of the importance of the thymus gland and of its wide connexions with the metabolism of the body, especially in the period up to puberty. Basch and Klose have found that when the thymus gland is extirpated in puppies quite early in life the animals grew more slowly than the control animals. Their muscles were more flabby, their bones were softer and more liable to bend and break, their intelligence was less, and after the fourth month they rapidly passed into state of coma and died. Microscopic examination of the bones showed the characteristic changes of rickets. Klose carried out elaborate examinations of the calcium excretion in these animals and showed that the tissues of the experimental animals were markedly deficient in lime salts. He believes that the thymus is chiefly engaged in hindering the formation of, and in neutralizing the excess of, acids in the organism, and that its enucleation leads to an acid excess in the system. He states that some of the symptoms in the animals remind the observer forcibly of the manifestations of tetany in young children. These observers and others have found that there is an intimate connexion between the thymus and the testes, which tend to enlarge by the growth of fibrous tissue in them after thymectomy. Miss Hewer [5] has lately obtained somewhat similar results in a series of rats fed upon fresh gland substance; the male rats showed retardation of sexual maturity and often degeneration of the testis. Other experimental work appears to indicate that there is a more or less intimate connexion between the thymus and the other glands of internal secretion: the suprarenals, the thyroid, and possibly the pituitary. These deductions, however, rest at present on insufficient grounds.

The net result of these investigations is, I think, to widen our conception of the functions of the thymus, and incidentally of status lymphaticus. This condition is not merely a disorder of the thymus but a much more complicated disorder of the whole "ductless gland" system, and until we obtain a clearer conception of the inter-relations of these glands we shall not progress in our understanding of status lymphaticus.

DIAGNOSIS AND TREATMENT.

Meanwhile it is necessary to recognize the extreme importance of diagnosing the condition, since it so often leads to tragedy. The enlargement of the thymus is the most constant feature, and we must endeavour to discover its existence in all cases of children who are to undergo an operation, especially in those who are the subjects of lymphoid hyperplasia. The most valuable means at our disposal is certainly the discovery of an increased area of dullness over the manubrium sterni. The normal impairment is said to be a V-shaped area scarcely transgressing the margins of the bone, while, in enlargement of the gland this area passes for $\frac{1}{2}$ to $\frac{3}{4}$ in. to either side, and below joins the cardiac dullness. Next to this the X-ray is of some value, but I do not think will distinguish between a thymus and enlarged lymphatic glands in the anterior mediastinum. If with these physical signs there is a tendency to unexplained attacks of dyspnoea or to a persistently low vitality, as evidenced by subnormal temperatures and intolerance of exertion, I think that status lymphaticus should be diagnosed, and the child should not be exposed to the danger of an anæsthetic.

Dr. Leonard Williams [12], in the discussion on Gardner's paper, held that the status lymphaticus was, in reality, an expression of disordered metabolism on the part of the thyroid gland, and that the administration of thyroid extract would avoid many of the accidents met with in the course of anæsthetizing children. While I cannot personally feel that there are any good grounds for the indictment of the thyroid in this condition, I yet recognize that it is almost certainly a disorder of the "ductless gland" system, and therefore that it is legitimate to expect something from the employment of an extract which we know has a profound effect upon this system. I should myself be more inclined to use pituitrin, an extract which has the most extraordinary effect in obviating the results of shock; and to "shock" in a broad sense it appears to me that we may attribute the fatal results of the lymphatic state. Wherever I suspected the existence of the condition I should feel inclined to give an injection of this drug before administering an anæsthetic, and I should be glad to hear of the results of such administration on some of the children who are said to be the subjects of thymic asthma.

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DISCUSSION.

The PRESIDENT (Dr. Leonard G. Guthrie) said all present might agree that the paper read was brief, but not that it was by any means inadequate, for Dr. Thursfield had covered the whole ground, so that but little further remained to be said. He hoped, however, that members and visitors would deal with the points raised, and express their views.

Dr. LANGMEAD said that all present must have been, like himself, much interested in Dr. Thursfield's paper. Referring to thymic asthma or lymphatism with an enlargement of the thymus causing dyspnœa, he said that he had seen cases in which he had suspected the condition, but he had not proved it in any single instance.

With regard to the greater question of the relationship of lymphatism to sudden death, he was still among the sceptics in his attitude towards the *majority* of recorded cases. There were cases in which the thymus was as large as the heart, or nearly, but those were quite exceptional. He thought that the average size of the thymus was greater than Dr. Thursfield had said. He would not be disposed to acknowledge a thymus of less than 20 grm. as abnormal in size. It was not an easy matter to decide upon the normal amount of lymphatic tissue of children. One scarcely ever had an opportunity of making an autopsy on a child who had not been ill and wasted to some extent, and atrophy of the thymus had been so prominent a feature in wasting disorders that marasmus had been attributed to it by

some observers. Probably lymphatic hypoplasia occurred rapidly, and he would like an estimate of the condition of the lymphatic tissue in children who had died suddenly for sufficient reason when previously they were in perfectly good health. There were not many such, and consequently the average size of the normal gland could not be obtained by taking the average of all thymuses removed after death. In other words, how many children who were run over by an omnibus and killed from fracture of the skull or rupture of the liver, or met their death in similar ways, would show evidences which would result in the diagnosis of lymphatism if they had died under an anæsthetic. He thought that in about 80 per cent. of the recorded cases of lymphatism the condition of the lymphatic tissue found after death was normal. Many times he had found that children who had died accidentally, and who had been fed almost up to the time of the accident, showed after death a condition which might be put down as lymphatism—namely, enlargement of Peyer's patches, large Malpighian follicles in the spleen, the thymus much larger than the book description, and much obvious lymph tissue elsewhere. That was why he hesitated to accept most of the cases of supposed lymphatism.

The anæsthetist, he thought, was apt to take up a wrong attitude towards death on the operating table. If an anæsthetist had a large number of cases without a death, he was anxious, when a death did occur under the anæsthetic, to find some special reason for the death, either an anatomical reason, or a defective way of administering the anæsthetic. He thought that less would be heard about lymphatism if it were acknowledged that there was a certain unavoidable proportion of deaths in children under an anæsthetic. Dr. Thursfield had referred to Dr. Spilsbury, who, of course, made large numbers of post-mortem examinations on patients who died in ways which rendered an inquest desirable. He did not mention, however, that Dr. Spilsbury had detected fatty degeneration of the heart in cases of lymphatism. He would like to know Dr. Thursfield's idea as to the influence of that upon the sudden death.

In conclusion, he wished to ask Dr. Thursfield whether he had statistical evidence, and if not, whether he had a conviction, as to the frequency with which signs of lymphatism were found in children who had died suddenly but who were in a wasted condition. His own impression was that evidences of lymphatism were comparatively rarely found in marasmic children.

Dr. SIDNEY GILFORD pointed out that a standard weight of the thymus gland was stated, but never its normal weight compared with the weight of the body. He thought it would be interesting to know the weight not only in proportion to the body but for certain ages. It would better enable the observer to know whether in any particular case there was an increase in the thymus. He had become very tired of hearing status lymphaticus given as the cause of death; one saw it stated in connexion with so many inquests on fatal accidents in children. Last week the same verdict was returned in the case of a man who was found dead in bed. There might be something in it, but he felt certain many deaths were wrongly attributed to it. If death were not, in these cases, due to pressure, he would like to know whether the weight or size of the gland had any direct connexion with the death. Possibly some other factor should be taken into account. The statistics on the matter seemed to be slender, and he hoped information would be forthcoming as to the weight and size of the gland for different ages and body-weight in health and disease.

Dr. MAHOMED said he had no knowledge of status lymphaticus from observation, but thought he might be allowed a remark or two from the standpoint of analogy. In the absence of definite information all that was possible was to rearrange arguments or consider analogies. Obviously all the internal ductless glands bore a relation to one another, and deficiency in one was sometimes compensated for by excess in another. If in puppies the thymus was excised they developed a condition similar to rickets. It was well known that pituitary disease was associated with enlarged bones in acromegaly. He (like Dr. Thursfield) would recommend the injection of pituitary extract as a possible preventive of death from an enlarged thymus gland. It was curious to hear the author say that cases of enlarged thymus and enlarged lymphoid patches about the body were associated with a predisposition to infectious diseases. That was contrary to what one would expect, because we were taught that lymphoid tissue acted as a kind of lock-up wherein poisons were incarcerated. For instance, a poisoning of the big toe resulted in enlarged glands in the groin. Therefore one would expect that a hyperplasia of lymphoid tissue would correspond to a protective influence against infective states. When studying the action of ductless glands one was disposed to think there was much in the old idea of temperaments; there were certain temperaments which seemed to be due to the activity of the internal secretions. The emotional or

sanguine temperament is often associated with an enlarged thyroid. Girls with enlargement of the thyroid gland flushed easily, often had dilated pupils and a good skin and were somewhat emotional. Such a person should be contrasted with the case of pituitary disease, who had large bones and was slow of comprehension, possessing what the older physicians termed the lymphatic temperament. Then there were the cases of Addison's disease, which had abnormal prostration and lack of nerve power, and wasting. If this were due to under-secretion from disease, it rather implied that hyper-secretion might be found in the athlete, that it connoted power of prolonged muscular effort and endurance. The relationship of the thymus gland to the sexual glands was also interesting; if the testes were removed the thymus gland became enlarged; and conversely, if the thymus were removed the testes became enlarged.

Dr. HEASMAN said that eighteen months ago he was asked, in private practice, to enucleate the remains of tonsils, which were septic, of a boy, aged 12 years, who was a chorister in a college cathedral. The tonsils had been operated on some five or six years previously and adenoids removed. He also had two anæsthetics previous to the enucleation of tonsils, and had taken them well. Up to three years before his death he was a particularly lively boy, but for the remaining three years he became quite slack, and lay about instead of joining in the boyish games. The anæsthetic was taken very well, and he (the speaker) started to enucleate the tonsil. He had just cut the upper portion of the right tonsil free, when the boy stopped breathing. Breathing was, however, recovered, and he seemed to be breathing fairly well again, and the operation was proceeded with. But there was again irregular breathing for twenty minutes to half an hour, and then he died, various stimulations being without avail. At the post-mortem examination the thymus was found to be $1\frac{1}{2}$ oz. in weight, and the Peyer's patches, the solitary glands of the abdomen and the tracheal and bronchial glands were also enlarged. The spleen was normal. He concluded it was a case of lymphatism. Three or four months later he was asked to give an anæsthetic for a case at the hospital, that of a fat, flabby boy, aged 16 years. He said to the surgeon that if there was any patient who looked like the subject of lymphatism it was that boy. As a precaution he was given an injection of adrenalin. He took the anæsthetic well, and the operation went off without event. So he did not know whether it was a case of the condition, the situation being saved by the adrenalin.

MR. PHILIP TURNER considered that the subject was an extremely interesting one, and to a surgeon it was also one of great importance on account of it being a possible cause of death during the administration of the anæsthetic and during the progress of operations. It was an explanation which was very frequently given to account for sudden death in these circumstances, and most surgeons and all anæsthetists certainly believed in the existence of status lymphaticus. That being so, the diagnosis of it became a matter of the greatest importance, because if one recognized the condition as present in any case, one would certainly avoid operation in that case unless it were a matter of urgent necessity. Excluding one or two instances of so-called thymic asthma, he could not recall a case of status lymphaticus having ever been diagnosed, though he could remember one or two, such as those mentioned by the last speaker, who were thought, in consultation with the anæsthetist, to have status lymphaticus, but in those cases nothing untoward had happened at the operation. Dr. Thursfield particularly mentioned percussion and X-ray examination. Status lymphaticus was said to occur frequently in patients who had adenoids and enlarged tonsils. When one remembered the vast number of children who came to children's and other hospitals because of enlarged tonsils and adenoids, it would be seen that the diagnosis of status lymphaticus by either of those means was a practical impossibility. One got into the way of simply observing the child and judging from its general appearance whether it would be able to take the anæsthetic satisfactorily. In reference to Dr. Langmead's question as to whether sudden death could be so frequently attributed to status lymphaticus as was done, two things occurred to him (Mr. Turner) in support of the generally accepted view. One was that sudden death occurred, as Dr. Thursfield pointed out, in very much the same way in exophthalmic goitre as in status lymphaticus, and there seemed to be some relationship between Graves's disease and the status lymphaticus, especially as enlargement of the thymus was so common in the former. Dr. Langmead also asked whether mention was ever made of enlargement of the thymus gland when a child died from some obvious injury, such as being run over. That brought to his mind the instance of the child who was killed by strangulation with a cord on the North London Railway a few months ago. Dr. Spilsbury did the post-mortem examination, and although he had no doubt that death was due to strangulation, Dr. Spilsbury mentioned the fact that the child was suffering from status lymphaticus, and attributed the death, in part, to that cause. He was very interested at that, seeing that the marks on the body seemed to fully account for the death by strangulation.

Dr. HYL A GREVES said he recently saw a case which might have some bearing on sudden death during anæsthesia, although death did not take place in that instance. A patient of his was suffering from enlarged tonsils and glands and from adenoids. Thinking there might be some risk from the anæsthetic, he warned the anæsthetist to be particularly on the look-out, and he (the speaker) was himself present at the operation. Only a drachm of chloroform was given to the child, and he suddenly noticed that the child changed colour and was pulseless. He called attention to the condition, and strychnine and atropine were injected, but without effect. The child had a very flexible thorax, and the operator compressed it with his hand. He (the speaker) also gave the child an injection of pituitary extract. Within a minute or two of the administration of the pituitary extract there was a slight return of pulse, and the child recovered to such an extent that the operation was completed. It was possibly a case of status lymphaticus in which death was prevented by a timely dose of pituitary extract.

Dr. CHARLES W. CHAPMAN said a point which had not yet been raised in the discussion was as to the frequency of death in this condition when chloroform was the anæsthetic. A well-known surgeon at Guy's Hospital told him he rarely allowed chloroform in throat cases, and never in operating for enlarged tonsils, but used ether instead, because he had seen so many critical cases, some of which were fatal. In all reported cases of death from status lymphaticus the speaker thought the special anæsthetic should be stated.

Dr. E. CURTIN said: I have tried to get some literature which would enable me to take an intelligent interest in the discussion. Dr. Herbert French says there is no such condition, that it is not a clinical entity, and that children killed accidentally had the same condition of lymphatism as those who were supposed to be suffering from enlarged thymus. The conception of status lymphaticus seems to me to be too narrow, and Dr. Mahomed was probably nearer the mark when he referred to the hypophysis as taking an active part in it. Removal of the thymus is said to be followed by obesity, stupidity, rickets, and a marked lowering of blood-pressure, increased rapidity of pulse, and a tendency to cardiac collapse. It is also said to lead to hypertrophy of the chromaffin bodies and to an excess of adrenalin in the blood. If this be true, the enlarged thymus which is supposed to be the offending organ in status lymphaticus cannot be properly functioning; in fact, the

functioning might be subnormal. Excessive activity of the adrenal glands, supported probably by the pars nervosa of the pituitary which is developed from the same source, and to which it is related in action, might through vagus stimulation, plus peripheral resistance, produce a slowing of the heart and lead to cardiac inhibition and sudden death. Terrien has drawn attention to a condition of periodical vomiting in children, which he considers of adrenal origin. The attacks are accompanied by acetonæmia and a tendency to sudden death. Volatile anæsthetics rapidly combine with lipid bodies in the plasmatic membrane of the cells. These lipid bodies are produced in excess by the suprarenal gland upon stimulation of the splanchnic nerves. Now, the secretions of hypophysis and adrenals excite the vagus nerves and contract the systemic vessels, and, given these conditions, it is not difficult to conceive the method of sudden death from anæsthetics. It is well known that injection of adrenalin greatly increases the danger of chloroform. The so-called status lymphaticus is probably due to some constitutional abnormality expressing itself in disturbance of the whole internal secretory system. To attribute sudden death to over-activity of the thymus seems unwarranted.

Dr. THURSFIELD, in reply, said he believed that even Dr. Langmead, who had confessed himself a sceptic, would not go so far as Dr. Herbert French, for there certainly was such a condition, whatever name might be applied to it. It was a constitutional disorder in which the patient was peculiarly liable to sudden death, and the death might occur under any kind of stimulus. He mentioned in the paper that McCardie stated that out of thirty such cases of sudden death, in six ether alone was the anæsthetic given, while in two local anæsthesia was induced. Such a proportion represented probably equality of incidence, for in this country chloroform was the predominant anæsthetic for children. In America chloroform was hardly ever given, ether was the drug used, yet still these cases of sudden death were as frequent there as with us. Again, deaths from operation on tonsils and adenoids were not more common than in any other condition. He, personally, did not remember to have seen a case in which status lymphaticus was diagnosed in a patient who died under an operation for removal of tonsils and adenoids. Bellamy Gardner's case, which was a classic on account of the pains he took in recording it, was a tonsil and adenoid case, and others had been recorded, but he had not himself come across one. Whatever name might be given to the condition, one met with these almost melodramatic

deaths in children for which no definite cause could be assigned. Before the condition could be discussed some name must be found for it. The name "status lymphaticus" was purely provisional; it could be called "status lymphatico-thymicus," or "status thymico-lymphaticus," or Paltauf's disease. He believed that the thymus, perhaps with other ductless glands, was much concerned in the condition; and that enlargement of the thymus was only part of a general condition, but was the obvious index to the condition.

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Clinical Section.

October 10, 1913.

Mr. CHARTERS J. SYMONDS, President of the Section, in the Chair.

Local Treatment of Vincent's Angina with Salvarsan.

By J. D. ROLLESTON, M.D.

A POLICEMAN, aged 20, was admitted to hospital on August 2, 1913, certified to be suffering from diphtheria, on the seventh day of disease. Condition on admission: Fauces slightly injected, dirty deposit on right tonsil, numerous Vincent's organisms in smear. Throat cultures taken on admission and on each of the two following days showed absence of diphtheria bacilli. No antitoxin given.

August 3: Well-marked ulceration of right tonsil. In spite of various local measures successively adopted—viz., application of methylene blue powder, syringing with a solution of potassium chlorate and lavender, and painting with tincture of iodine, the ulceration spread on to the palate and uvula, which became oedematous and covered with a dirty slough. There was considerable submaxillary adenitis. The throat became increasingly painful with some difficulty in swallowing and pain in both ears.

On August 17 all other treatment was omitted and a throat swab moistened with glycerine was dipped in salvarsan powder and rubbed all over the affected area. The application was not painful, and within four hours the throat felt much easier.

August 18: Slough clearing off palate and uvula; sore throat and earache less. Still numerous Vincent's organisms in smear. Second application of salvarsan.

August 19: Slough entirely cleared off; adenitis subsided; throat no longer sore; no earache. Third application of salvarsan.

August 21: No Vincent's organisms in smear.

2 Rolleston: *Treatment of Vincent's Angina with Salvarsan*

August 25: Still an opaque area on upper part of uvula and soft palate. Fourth application of salvarsan.

On his discharge on August 30 only a very small opaque area was visible on the uvula, but within a week the throat became perfectly normal and has remained so since. Although the local discomfort was considerable there was no constitutional disturbance, the urine was free of albumin, and the temperature was normal throughout his stay in hospital, except on the day of admission, when it was 99° F. There was no history or evidence of syphilis, and Wassermann's reaction (August 17) was negative.

Vincent's angina is not a very common disease. Owing to the frequency with which it is mistaken for diphtheria it is more likely to be met with in fever hospitals, in this country at any rate, than elsewhere. The following figures illustrate the frequency of its occurrence: From 1905 to 1912 inclusive, 4,704 cases of diphtheria were admitted to the Grove Fever Hospital, and another 809 cases certified to be suffering from diphtheria were found, after admission, to have other forms of sore throat. Among these were forty-one cases of Vincent's angina, so that it occurs in 0·7 per cent. of all cases of sore throat, and in 5·05 per cent. of non-diphtheritic angina.

Vincent's angina is usually a mild disease. With the exception of the present case and that of a little girl I showed at the Section for the Study of Disease in Children in April, 1912, all the forty-one cases yielded readily to applications of tincture of iodine or methylene blue powder—the usual treatment for the condition. There are only ten other cases on record, as far as I can find, in which salvarsan has been employed locally in Vincent's angina, usually after failure of other methods (Achard and Desbouis, Achard and Flandin, Anglada and Réveille, Citron (two cases), Rénon and Desbouis, Lebenthal, Roger (two cases), and Sourdel.) In every case except that of Lebenthal, in which the cure was not more rapid than that usually obtained by methylene blue, the lesions healed remarkably quickly. No toxic symptoms occurred in any case. The methods of local treatment by salvarsan have differed slightly: the use of diluted acid, or alkaline solution, the insufflation of the powder, and lastly, as in the present case, the application of the powder on a swab moistened with glycerine, have all been recommended. The application may be made once or two or three times daily.

Salvarsan was first used intravenously in Vincent's angina (Ehrlich, Gerber, Rumpel), but Citron, who has tried both methods, has found that direct application is much the most efficacious; the action of salvarsan on the buccal spirochætes being only transitory when it is given intravenously. Though, in some cases—e.g., that which I last reported—Vincent's angina may be associated with considerable constitutional disturbance, in the present case the disease was entirely local. Active treatment, however, was required owing to the failure of other methods and the possibility of destruction of the uvula

or even of fatal hæmorrhage, of which Delsaux has recently recorded an example.

The local treatment of Vincent's angina by salvarsan may justly be described as simple, safe, and sure. An objection to its expense has been made. Thus Lebenthal states that a case of mercurial stomatitis so treated cost 10 fr. a day, and that ten days were required before the cure was complete. In the present case the expense was considerably less, little more than two shillings' worth of the drug being used. After this patient had been discharged from hospital I received a paper from Dr. Delsaux, of Brussels, who recommends a blood examination in every case of Vincent's angina as a guide to treatment. He urges that in cases in which anæmia is pronounced intravenous injection should be associated with local applications of salvarsan. No examination of the blood was made in this case. I may add that the child who lost her uvula developed leucocythæmia and died four months after her recovery from Vincent's angina.

Salvarsan has also been used topically in other localizations of Vincent's organisms—viz., ulcero-membranous stomatitis (Roger), noma (Netter), mercurial stomatitis (Zilz, Le Blaye) and balanoposthitis (Roger), as well as in other conditions unconnected with syphilis, such as soft chancre (Melun, Lévy-Bing and Morin) and varicose ulcers (Lévy-Bing and Durœux).

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Case of Actinomycosis of the Cheek treated by Parenchymatous Injections of Formalin.

By G. H. MAKINS, C.B., F.R.C.S.

THE patient, a boy, aged 17, was admitted into St. Thomas's Hospital in January, 1913. Two months previously an alveolar abscess had developed in connexion with some carious teeth. The abscess was incised, and shortly afterwards a hard, brawny swelling developed in the right cheek. On admission this swelling occupied an area of about the size of a half-crown piece. It was bluish-red in colour, very hard, and firmly fixed to the surface of the maxilla. Four discharging sinuses were present, and on examination of the pus exuding from these the streptothrix of actinomycosis was discovered.

During the month of February iodide of potassium, beginning with 5-gr. doses, rapidly increased to 20 gr., was administered internally three times daily. On February 21 two hypodermic syringe-fuls of 4 per cent. formalin solution were injected around the periphery of the indurated area and into the margins of the area itself. The injection was followed by considerable swelling of the cheek and lower eyelid.

A second injection was made on April 4, after which all the sinuses closed. Meanwhile considerable diminution occurred in the extent of the induration.

Further injections were made on April 22, May 30, and July 16. Each injection was followed by considerable local œdema which rapidly subsided, after which the indurated tissue became less in extent and freely movable upon the maxilla. The injections were necessarily made around the circumference, since the fluid could not be freely forced into the indurated area.

At the present time the cheek is nearly normal, the only fixed spot corresponding with the cicatrix of the largest of the sinuses present when the formalin treatment was commenced.

Case of Complete Destruction of a Part of the Diaphysis of the Tibia by Acute Osteomyelitis.

By T. H. KELLOCK, M.C.

H. M., AGED 8, two years ago had a sudden acute illness associated with much pain and swelling of the left leg below the knee. Was in a country hospital for six months; an operation was performed and some bone removed. Several months later a second operation was performed. Now the wounds have quite healed. There is considerable mobility between the upper and lower ends of the tibia.

Skiagram shows that the epiphyses are present and there is some attenuated bone leading from them, but for a considerable space there is complete absence of bone in the situation which the shaft of the tibia should occupy. The fibula appears to be hypertrophied.

Case of Osteogenesis Imperfecta with Multiple Fractures.

By T. H. KELLOCK, M.C.

B. H., AGED 11½. Indefinite history. The patient is an orphan, both parents having died of small-pox when he was aged 3 months. He was breast-fed for nearly three months. It cannot be ascertained whether any deformity was present when he was an infant. He did not walk until he was 4 years of age, and is said not to have talked until six months ago. There are five brothers and sisters, all of whom are said to be healthy.

The child presents marked deformities of the long bones; the tibiae and fibulae are markedly bowed forwards; the femora are curved; the humeri show marked thickening about the bicipital groove. Some of the epiphyses, especially those at the wrists, are enlarged.

Skiagrams show the long bones to be more translucent than normal and to show comparatively little compact tissue. Spontaneous fractures are seen in the tibiae, radii, and ulnae, with practically no displacement of the fragments.

The Wassermann reaction is negative.

Splenic Enlargement, Hæmorrhage, Anæmia, with Oral Sepsis.

By W. ESSEX WYNTER, M.D.

D. Y., AGED 50, had severe epistaxis in May, 1913. He went to hospital and the teeth were attended to after the bleeding had been stopped. On August 10 there was sudden pain below the left ribs; the spleen was found enlarged, and when admitted to hospital on August 20 it extended to within $1\frac{1}{2}$ in. of Poupart's ligament, and 2 in. beyond the umbilicus in the middle line. It was firm and not then tender. Heart and lungs normal.

On September 10 sudden and severe pain occurred over the spleen, with subnormal temperature, vomiting and collapse. Friction could be heard over the organ, which was apparently the seat of an infarct. A similar attack occurred two days later, but less severe, and no friction could be detected. On September 18 severe and persistent epistaxis occurred, which was only arrested by plugging the nostril. On September 25 this recurred with less severity, both attacks being preceded by severe headache. No lesion of the mucous membrane could be detected. Apart from the leucocytic count the picture is that of splenic leukæmia.

BLOOD COUNT.

	Red cells	White cells	Hæmo-globin	Index	Lympho-cytes	Hyaline	Polymorpho-nuclears	Eosino-philes	Mast cells
August 20	4,800,000	25,000	60	0·62	16·4	13·4	62·8	0·2	0·2
'	2,505,000	15,000	52	1·0	18·2	11·4	61·2	1·0	1·4
October 3	1,430,000	10,000	54	1·2	39·2	13·6	46·0	1·2	—

Urine contains 0·3 albumin per cent., but is otherwise normal; specific gravity 1020; acid and clear; albumoses not found. The teeth are much decayed, have been entirely neglected, and there is extensive pyorrhœa.

Dr. CHARLES W. CHAPMAN referred to a case of septic endocarditis with profound anæmia and enlargement of both liver and spleen. There was no history of the usual causes of cardiac disease and on inquiring as to the state of the mouth he was told a dentist had quite recently pronounced it healthy. Not being, however, satisfied he had the mouth examined by Mr. Lloyd Williams, who found pus could be obtained from the sockets of all the teeth. Vaccine treatment was adopted without avail.

Splenic Enlargement, Hæmorrhage, Anæmia, and Arteritis Obliterans with Oral Sepsis.

By W. ESSEX WYNTER, M.D.

M. T., AGED 55, has suffered for twelve months with attacks of pain in the toes and fingers, and a month ago submitted to amputation of the left second toe for moist gangrene; about the same time the third toe on the same foot was affected with dry gangrene. Ten months ago there was slight uterine hæmorrhage. The patient continued at work as housekeeper though feeling weak and tired. On August 20 to August 22 last severe hæmorrhage from the nose and mouth occurred, the loss of blood being estimated at two pints. Previous health had been good.

On admission to hospital on August 25: The skin exhibited a waxy pallor. The spleen, which was hard and not tender, could be felt 2 in. below the costal margin and there was slight enlargement of the liver with similar characters. The abdomen was lax and no free fluid existed in the cavity. A hæmic murmur could be heard over the præcordia, otherwise the heart and lungs showed no physical signs. Partial dentures were worn over numerous stumps and the gums were in a very septic condition. Wassermann's reaction negative.

BLOOD COUNT.

		Red cells		White cells		Hæmoglobin		Index
August 30	...	2,800,000	...	20,000	...	30	...	0·54
September 10	...	3,220,000	...	17,500	...	45	...	0·63
„ 20	...	2,860,000	...	38,400	...	36	...	0·64

Analysis of the white cells on the last two occasions gave:—

Lymphocytes		Polymorphonuclears		Hyaline		Eosinophiles		Blastocytes
8·8	...	85·4	...	2·0	...	3·4	...	0·4
7·0	...	85·2	...	5·2	...	2·4	...	0·2

Urine: Medium amber, clear; specific gravity 1018; no sugar or albumin. Some pain was complained of in the right knee and leg on September 15, which subsided with the administration of liq. trinitrini, 2 minims three times a day. The arterial pulsation was difficult to feel, especially in the right ankle and foot.

Angioma of Synovial Membrane of Elbow.

By Sir FREDERIC EVE, F.R.C.S.

C. M., AGED 11. History: One year and nine months ago the elbow became swollen and painful and she was laid up with it for a fortnight. The swelling was attributed to a blow on the part two or three years previously. Since then the elbow has become swollen every few weeks.

Present condition: There is a bluish bilobed swelling on the outer side of the head of the radius; the swelling disappears on raising the arm; after applying an elastic ligature to the upper arm it stands out prominently and the circumference of the limb at the site of the swelling is increased $\frac{1}{4}$ in.

Remarks: The writer drew attention to this condition in a paper in the *Clinical Society's Transactions*, 1903, xxxvi, p. 204, and described two cases of angioma involving only the synovial membrane, and two others implicating also the surrounding muscles. The chief interest of the condition lies in the diagnosis from localized tuberculosis of the synovial membrane. This may usually be made by observing the changes in the swelling induced by alterations of the venous circulation. Angiomata of synovial membrane often give rise to a good deal of pain, increased by exercise. There may be tenderness, limitation of movement, wasting of muscle, and two of the writer's cases complained of starting of the limb at night.

[The patient was operated on and a cavernous angioma found involving the synovial membrane, capsule of joint, and adjacent muscles.]

Bazin's Disease.

By Sir FREDERIC EVE, F.R.C.S.

Miss C., aged 31. History: The trouble began as a hard swelling on the outer side of the left leg which broke down and discharged. An ulcer formed, which gradually spread. When I first saw her in March, 1913, there were two thin oval cicatrices on the outer side of the lower third of the left leg. At the lower and outer margin of these cicatrices was a rim composed of irregular pit-like ulcerations covered with flabby granulations. The general appearances were those

of a serpiginous ulcer. There was also a very small ulcer on the inner side of the same leg.

The patient appeared perfectly healthy, and a Wassermann reaction was negative. The ulcerated areas were excised and skin-grafts were applied. At the same time the affected part was exposed to the X-rays. As a result of this treatment complete healing took place. Later a few pit-like ulcers reappeared, but they healed after applications of pure carbolic acid and fomentations of 1 in 5,000 watery solution of biniodide of mercury, and she returned home. About three weeks subsequently the small ulcer on the inner side of the left leg broke down again, and a sore appeared on the right leg. Small areas of the margins of the scars on the outer side of the left leg also broke down.

While in hospital she has been treated by X-rays and has been kept in bed.

DISCUSSION.

Dr. CHARLES W. CHAPMAN related a case of Bazin's disease which was under his care twenty years ago, in which he had the benefit of the late Sir Jonathan Hutchinson's opinion and advice. The lady was aged 22, with numerous scars of suppurating glands on both sides of her neck, her general appearance being that described as strumous by old writers. Both legs were swollen and hard; there were ulcers below the knees symmetrically placed, and the general circulation was feeble. Cod-liver oil and tonics were of no avail until the patient went to the Canary Islands, when improvement soon set in, and she had resided at Teneriffe most of the year ever since.

Dr. JAMES GALLOWAY drew attention to certain peculiar features of the ulceration of the leg in Sir Frederic Eve's case, and ventured to suggest that in this patient there were considerable difficulties in making the diagnosis of Bazin's disease. He pointed out the comparatively superficial character and wide extent of the ulceration. The facts that the spots preceding the ulceration were little indurated, resembling (according to her own statement) gnat-bites; that the spots rapidly ulcerated, no longer than three weeks intervening between the appearance of the spot and the appearance of ulceration; the position of the ulcers on the lower portion and even in front of the leg; the comparative want of symmetry of the outbreak, one leg only being noticeably affected; the want of induration; the very superficial character of the ulcers, and the age of the patient—were all points against the diagnosis of Bazin's disease. It should be remembered that the condition known as Bazin's disease—a name now very loosely employed—was described originally as *erythema induratum*.¹ The indurated character of the erythema, the indolent

¹ "Erythème induré des Scrofuleux," Bazin, "Leçons sur la Scrofule," 1861; cf. Colcott Fox, *Brit. Journ. Derm.*, 1893, v, p. 225.

course of the lesions, the occurrence of ulceration, being occasional only and often dependent upon external injury or accidental pyogenic infection, the symmetry of the affection, both lower extremities being affected, might be regarded as the characteristics of the condition. There seemed to be little doubt that some of the cases of erythema induratum were in close association with tuberculosis—perhaps even peculiar local manifestations of the disease. On the other hand, there were many cases of erythema induratum in which the relationships to tuberculosis could not be so easily established, and it was very evident that in the latter group, and probably in all cases, defects in the blood circulation, either of local origin or due to more general causes, had much to do with the appearance of the characteristic erythematous indurated nodules. He thought that Sir Frederic Eve's case could not be brought within this category and that some other cause of the ulceration must be sought for. The appearance of the skin of the extremities and of the patient suggested that the lesions might be due to degenerative conditions of the cutaneous vessels and capillaries rather than to any specific infective cause.

Tumour of the Thigh.

By PERCIVAL P. COLE, F.R.C.S.

M. E., MALE, aged 45, fractured right femur on February 10, 1913. Fracture at junction of middle and lower third. Considerable shortening and deformity, but owing to patient's cardiac condition it was deemed inadvisable to plate. He was treated on a Hadgen's splint for a few days, but pressure sores began to develop, and extension apparatus had to be abandoned. He was discharged eleven weeks after admission. An excessive amount of callus had been thrown out and union was not complete.

Re-admitted September 25. The swelling of the right thigh had gradually and painlessly increased, showing a circumference of $22\frac{1}{2}$ in., as against the normal $14\frac{3}{4}$ in. The swelling was elastic and semi-fluctuating, feeling like a tense cyst. Exploratory incision under spinal anæsthesia: Some mucoid gelatinous fluid escaped. Tumour composed of soft, jelly-like material, with spicules of bone embedded therein. This bled freely and surrounded the bone ends, which could just be felt.

Pathological report: Myxo-chondroma.

Previous history: Syphilis and enteric.

Case of Bilateral Atrophy of the Face.

By ARTHUR F. HERTZ, M.D., and W. JOHNSON, M.D.

C. F., AN Italian, aged 38, had until recently always been in excellent health. He is very well developed and served ten years in the Italian Navy. When he first came to England he followed the occupation of a plaster-modeller for five years, but for the last three years he has worked in a lead factory.



Bilateral atrophy of the face.

He presented himself for weakness of the right side of his face, complaining that the right eye closed incompletely during sleep. His face shows a well-marked condition of atrophy on both sides, especially the left. The cheeks are extremely hollow, and the tissues covering the bones of the face are very wasted. The facial paresis has improved greatly in the five weeks since he first came to the hospital. He can close his eyes quite firmly, and only when he smiles is any weakness of the right side of his face noticeable. He shows well-marked signs of chronic lead poisoning with great weakness of all the extensor muscles of the wrists and fingers of both sides. He has a blue line on his gums and is extremely constipated ; he has had numerous attacks of abdominal

colic. He showed no other signs of involvement of his nervous system ; the reflexes are all normal.

The accompanying photograph shows the atrophied condition of the face, which is in striking contrast with one taken ten years ago. His friends state that they noticed no change in his appearance until four months ago.

Dr. JOHNSON said he would like to add a few remarks as to the rarity of the condition. A perusal of the literature showed previously recorded cases by Wolff, Oppenheim, and Batty Shaw. It was, therefore, somewhat extraordinary that Dr. Hertz and he had been able to bring two such cases before the Section within twelve months. The first was the case of a man, aged 26, who had had double otorrhœa in childhood.¹ The present case, being associated with chronic lead poisoning, was interesting from the point of view of the ætiology of the lesion.

Case of (?) Syringo-myelitis.

By H. GARDINER, M.B.

MALE, aged 42. Right thumb was wounded by a splinter nine weeks ago. A good deal of pain and swelling occurred, the swelling reaching half up the arm. This quickly subsided but left the wrist-joint swollen but painless.

Present condition : Right wrist is swollen and contains fluid. There is a dorsal dislocation of the wrist-joint, easily reduced. The joint is quite disorganized with osteophytic changes and rough grating. It is entirely painless and the muscular sense is diminished. Sensation of heat and cold is also absent. Tactile sensation is affected to a slight degree. There is some scoliosis that has been present for many years.

A diagnosis of syringo-myelitis has been made.

Case of Bilateral Cervical Ribs.

By H. GARDINER, M.B.

FEMALE, aged 17. She complains of slight weakness of both hands, noticeable chiefly when stretching big chords on the piano, of which she is an able executant. The weakness has been noticed for three to four years and is increased after much practising. On examination

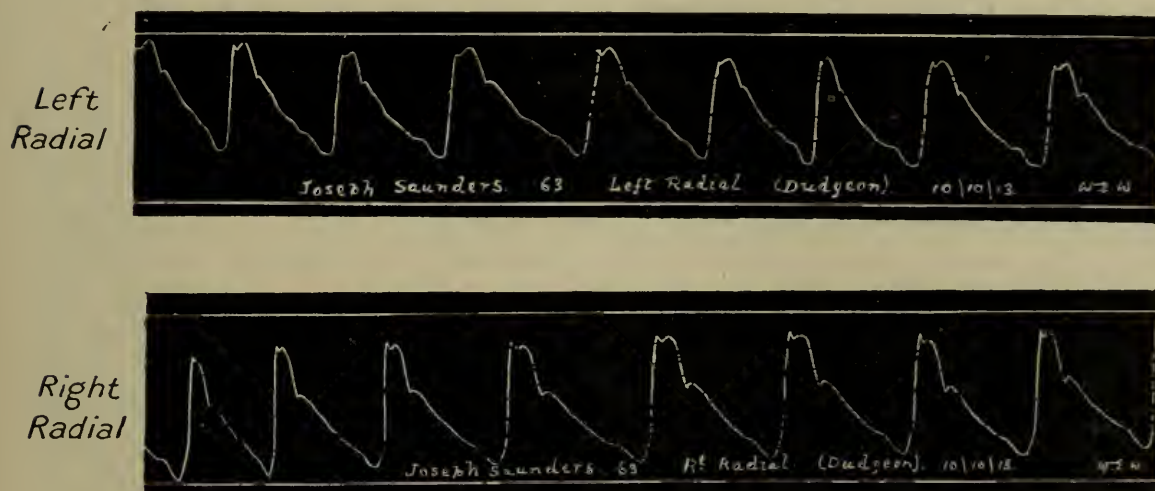
¹ See *Proceedings*, 1912, vi, p. 92.

very little abnormal can be detected in either hand, but the thenar and hypothenar eminences are not so well marked as one would expect in a well-developed pianist's hands. X-ray examination of the neck shows the presence of bilateral cervical ribs, very well developed.

Unilateral Clubbing of the Fingers associated with an Axillary Aneurysm on that Side.

By H. D. ROLLESTON, M.D., and E. F. W. GRELLIER, B.C.

A MAN, aged 63, labourer, well developed physically, has had pain in the left shoulder and arm for one and a half years; it has been worse



for the last three months, and during this time he has been conscious of a tumour in the left axilla, which has gradually increased in size. Two years ago he fell on the left shoulder. The blood gives a strongly marked Wassermann reaction.

The fingers show definite clubbing on the left side, but not on the right. The two wrists and forearms are equal in size, but the left upper arm is $12\frac{1}{2}$ in. on its greatest circumference, whereas the corresponding measurement on the right side is $11\frac{1}{2}$ in. The veins over the left arm and forearm are rather more distended than on the other side. Skiagrams show that there is not any bony enlargement in the left upper extremity. The blood-pressure is equal (150 mm. Hg) in the two arms, and sphygmograms taken by Dr. W. E. Waller are identical on the two

radials. There is tenderness over the left ulnar nerve, and pain in the left middle and ring fingers. There is not any atrophy of the short muscles of the hand, and sensation to touch and pinprick is unaffected. There is no œdema or cyanosis of the left hand. There is an aneurysm of the left axillary artery with some distension of the subcutaneous veins and a systolic murmur over it; there is a thrill in the subclavian artery on that side. The left common carotid is normal. The pupils are equal and react to light. The heart is somewhat enlarged and there is a double aortic murmur. The blood-pressure in the recumbent position is 150 mm. Hg in the arms and 200 in the legs.

Dr. Allpress Simmons reports that screen examination from the front shows a large, dense, horizontally placed heart, above which on the left side is a shadow projecting into the inner half of the left chest; and he concludes that the aneurysmal dilatation which presumably affects the left subclavian and axillary arteries is an extension from an aneurysm of the arch of the aorta.

Unilateral clubbing of the fingers is rare; Batty Shaw¹ refers to seven cases in association with aneurysm of the aorta and its branches. In J. W. Ogle's² case, in which there was an enormous aneurysm of the subclavian and the aorta, the radial pulse was absent and the hand was œdematous and cyanotic. Canton's³ and Sir T. Smith's⁴ cases had subclavian aneurysms. In this case the circulation in the arm, as shown by the blood-pressure and sphygmograms, is so good that it is doubtful if the clubbing can be referred to venous stasis, of which somewhat greater prominence of the veins than on the right side is the only evidence. The question of the advisability of operative interference on the axillary aneurysm in view of the presence of aortic aneurysm and incompetence is put forward for discussion.

Postscript.—After the patient was shown the systolic blood-pressure in the two arms altered; at first it became higher and subsequently lower on the left side than on the right side.

¹ Shaw, H. Batty, Allbutt and Rolleston's "System of Medicine," 1907, iii, p. 66.

² Ogle, J. W., *Trans. Path. Soc. Lond.*, 1858, x, p. 103 (with figure).

³ Canton, *Trans. Path. Soc. Lond.*, 1865, xvii, p. 428.

⁴ Smith, T., *Trans. Path. Soc. Lond.*, 1872, xxiii, p. 74.

Clinical Section.

November 14, 1913.

Mr. CHARTERS J. SYMONDS, President of the Section, in the Chair.

Case of Subcutaneous Granulomata.

By A. M. GOSSAGE, M.D.

E. W., A GIRL, aged $3\frac{1}{2}$, was admitted into hospital on August 12 last for stiffness in the left knee and pain and stiffness in the left wrist. At the age of 2 her mother noticed that the left knee was held stiff and slightly bent so as to make her walk awkward. Lately this had been worse, and the child frequently wanted to rest. Three days before admission the left hand was noticed to be doubled up, and she complained of pain in her wrist. No lumps had been noticed in the trunk or head. She had been subject to heat spots since the age of 1 year 3 months. The parents were healthy and the family history good.

On admission she was found to be a healthy-looking child. The left wrist was flexed, and the dorsum of the left hand was somewhat swollen; anteriorly over the tendons at the wrist there was some reddish discoloration, and there was some thickening under the skin. The child was unable voluntarily to extend the hand and fingers, while forcible extension caused pain. There were about twenty subcutaneous nodules, from the size of a millet-seed up to a small pea, under the skin of the scalp, neck, and trunk. The diagrams (fig. 1) show the situation of these nodules. These were not tender or painful, and the skin moved over them freely, but in some places was slightly discoloured. Those over the scapula moved with the movements of the arm. The swelling in front of the wrist seemed composed of several nodules matted together, but there was also some swelling of the skin.

itself, and the tendons were involved in the mass. The left knee was apparently normal, and no other abnormality could be found elsewhere.

In the night of August 29 there appeared pain and swelling in front of the right wrist, with flexion of the wrist and some swelling in the dorsum of the hand. On examination a precisely similar condition was found to that in the left wrist—i.e., some thickening and discoloration of the skin, and subcutaneous swelling, which appeared to be formed

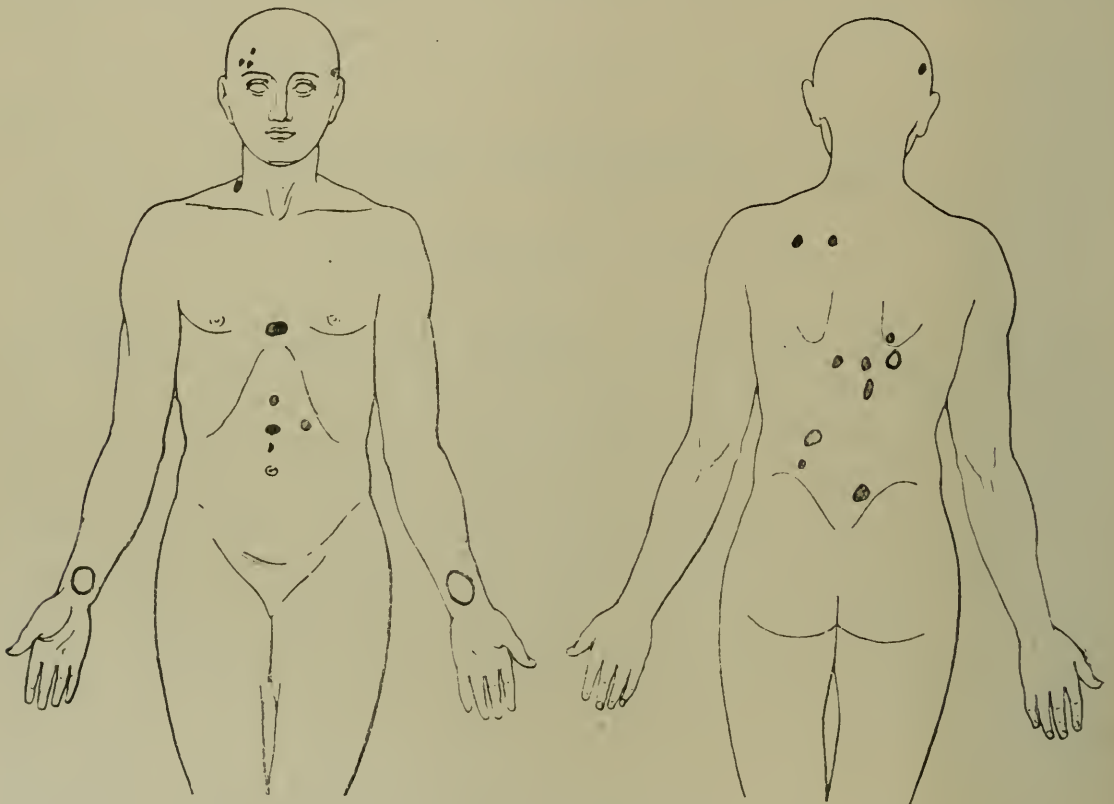


FIG. 1.

Diagrams showing the situation of the nodules (August 29, 1913).

of several nodules matted together, with involvement of the subjacent tendons.

On September 16 it was noticed that the right knee was sometimes drawn up, and that the child seemed unable to straighten the leg again, but forcible replacement by the nurse caused no pain, and there was no swelling, while the joint subsequently seemed to be all right.

There was no alteration in the condition until October 3, when she was ordered pot. iod., 3 gr., t.d.s. Since then the tumours have got

smaller and many have disappeared, while the swelling in front of the wrists has diminished, and the movements of the hands and wrists have become painless and free. The drug was discontinued on November 4, with the result that several of the nodules have become distinctly larger, and one on the back feels as if it were breaking down. A larger lump has appeared on November 12 over the lower ribs on the right side. Her general health has been throughout excellent.

On September 9 two of the tumours were cut out, and were subsequently examined by Dr. Hebb, who reports as follows: Both

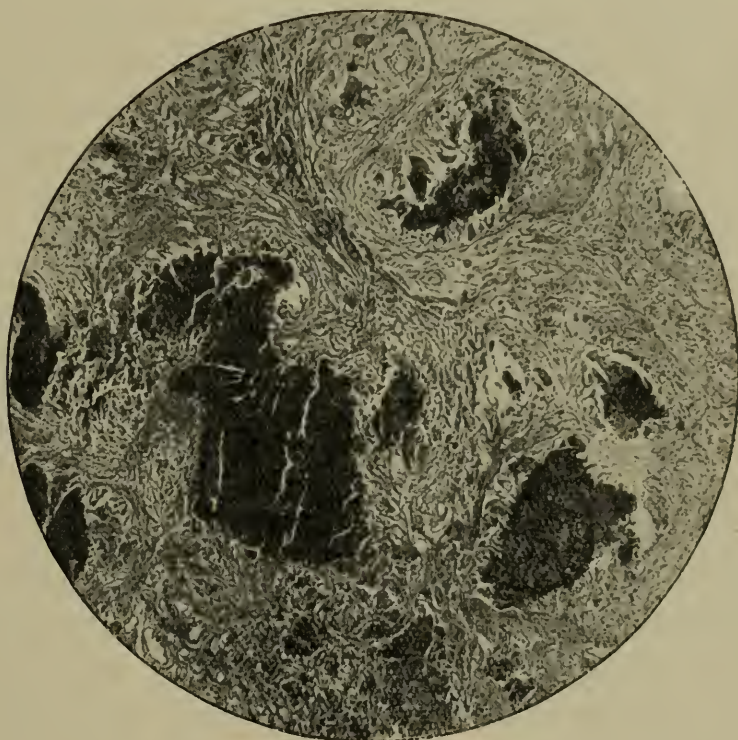


FIG. 2.

Microscopical section of the growth.

tumours are surrounded by a zone of connective tissue in which are reticular histological tubercles with numerous large giant cells (fig. 2). The central areas are filled with some homogeneous substance which is crowded with small cells of irregular shape; also certain bodies, somewhat resembling in appearance Charcot-Leyden crystals, are demonstrable by the Ziehl-Neelsen method. Nature of growth uncertain. No organisms (either cocci, bacilli, or streptothrix) discoverable. The tumours, having been put directly into formalin, no culture could be made from them.

Blood count, September 13: Serum to corpuscles, 4—3; hæmoglobin, 70 per cent.; red blood cells, 5,700,000; colour index, 0·61; white blood cells, 13,600; polymorphonuclears, 52·5 per cent. (fine 38, coarse 14·5); monomorphonuclears, 47 per cent. (large 2·5, small 45).

The Wassermann and von Pirquet reactions were both negative.

The three probable causes for granulomata of this type are (1) syphilis, (2) tubercle, and (3) sporotrichosis. There was nothing in family or personal history to suggest syphilis, and with a negative Wassermann reaction this may be excluded. The histological appearances, the rapid improvement with iodide of potassium, and the negative von Pirquet reaction similarly weigh against the diagnosis of tubercle. In the absence of a culture of the organism one cannot be certain of the diagnosis of sporotrichosis, but this seems to be that which is most probably correct. The return of the tumours after cessation of the iodide and the good general health are both in favour of this view. Assuming the diagnosis, the case would belong to that class which de Beurmann [3] tells us is the most common, where the organism gets into the blood and the distribution of the lesions is irregularly scattered over the body. In these cases the infective agent is taken in by the mouth together with food, the contagion passing in some way through the mucous membrane. Where the infection is through a wound in the skin the distribution of the lesions is along the adjacent lymphatics, though they may later become generalized.

The special points of interest in this case are: (1) That it has come under observation very early, and that none of the lesions have broken down; (2) the curious symmetrical affection of the tendons in front of the wrists, which, I believe, has not been previously observed; (3) the comparatively numerous nodules in the scalp, which, according to de Beurmann [3], is one of the least frequently affected parts.

Though comparatively common in France, sporotrichosis seems decidedly rare in this country. Many observers must have been on the look-out for cases in the last few years, but so far only three undoubted cases have been recorded—two by Adamson [1, 2], and one by Norman Walker and Ritchie [4].

drawn up,
but forcible

REFERENCES.

no swelling, ADAMSON. *Brit. Journ. Derm.*, 1911, xxiii, p. 239.

There was Jdem. *Proc. Roy. Soc. Med.*, 1913, vi (Derm. Sect.), p. 70.

was ordered p^E BEURMANN. *Brit. Med. Journ.*, 1912, ii, p. 289.

ALKER, NORMAN, and RITCHIE. *Brit. Med. Journ.*, 1911, ii, p. i.

DISCUSSION.

Dr. F. PARKES WEBER remarked that the nodules about the right scapula gave one the sensation of movable globular elastic capsules. They did not feel like ordinary gummata. In one case in which little elastic globular nodules could be felt in the subcutaneous tissue the nodules were discovered subsequently to be minute lipomata; in another case a biopsy showed a nodule to consist of an outer fibrous capsule with a fluid interior.¹ In the present case the histological examination negated the possibility of lipomata.

Dr. HALDIN DAVIS said that he had had an opportunity of seeing a case somewhat similar to the present one. It was one of the first cases diagnosed in this country and had been detected by Dr. Adamson, under whose care the patient had been at St. Bartholomew's Hospital. The patient was an old woman, aged 62, who had, when first seen, for about twelve months numerous subcutaneous swellings all over the body, many of which had ulcerated and given rise to chronic discharging fistulæ, the edges of which were deeply pigmented and the scars left by which were also deeply pigmented. Cultures from the pus yielded at low temperatures an exuberant growth of a darkly pigmented variety of the sporothrix.

Two Cases of Arthritis Deformans treated by Continuous Counter-irritation.

By W. J. MIDELTON.

Case I.—Woman, aged 60. Family history: Father suffered from malaria and sciatica. Previous history: Was very delicate as a child, only $3\frac{3}{4}$ lb. at birth. Had measles, pertussis, mumps, and tonsillitis; malaria at the age of 18; dysentery, 1878; small-pox, 1884; influenza, "pleurisy," "bronchitis," &c., at various times. History of present illness: Sixteen years ago first noticed rheumatic symptoms; joints of fingers, knees, and ankles eventually became markedly swollen up to two years ago in spite of treatment. Severe attacks of sciatica at times. Patient was first seen by me with a view to treatment two years ago. At that time she was very depressed, and in much pain. Salicylates relieved the latter somewhat, but increased the depression. On examination the patient was found to be too thin; all the phalangeal joints were swollen and of the rheumatoid type. The fingers were cyanosed. The knees and ankles showed enlargement of a soft character with little or no bony change. There were soft pads beneath the ligamenta patellæ bulging on each side. The legs were slightly

¹ Vide F. P. Weber's remarks in the discussion, *Proceedings*, 1913, vi, p. 22.

oedematous. There was a fibrous nodule at the back of the proximal phalanx of the left thumb, about the size of a small hazel-nut and very hard. Subcutaneous tissue of legs thickened, and suggestive of myxoedema. The toes were cyanosed and the nails withered very much, having practically disappeared in several instances. Very few teeth remained; patient had obviously suffered for many years from pyorrhœa alveolaris, and the teeth had in most instances become so loose as to need extraction. No marked affection of heart or lungs found, but the stomach and bowels were thought to be atonic. Pulse 84, regular; appetite, fair; tongue, slight fur; sleep, good; digestion, flatulence; bowels rather constipated; menses not seen for thirteen years. Treatment by means of continuous counter-irritation commenced on September 27, 1911. October 31: Swelling gone from fingers and tenderness from feet. Eventually became so well and active that she undertook strenuous work; on her feet all day, and out socially at night. Has from time to time had slight recurrences, but the treatment always readily subdues them, and patient remains well and active. The pads have gone from beneath the patellar ligaments, the nodule from the thumb, &c. She is wearing shoes that had been put aside for years, &c. Attacks of sciatica now slight. Toe-nails have grown again. Excessive fatigue contributes more to recurrences than anything. Patient dines out a good deal, and occasionally goes right through the menu, including a glass or two of champagne, but suffers little in consequence.

Case II.—Woman, aged 54. Family history unimportant. Previous history: Delicate as a child. Dropsical swelling of left knee at the age of 13; laid up six months. Always had menorrhagia. Married at the age of 20; three children born alive. First born at the age of 21, then a miscarriage. Rheumatic fever at the age of 24, laid up a year; all joints tender but not much swelling. Quinsies at the age of 30; not since. Peritonitis at the age of 35 following miscarriage; laid up for six months. A second attack the next year, cause unknown. Amenorrhœa and leucorrhœa at the age of 38 lasting six months. Menopause at the age of 40 lasted five or six years; free loss, health bad. Has had much family trouble. History of present illness: Five years ago ankles swelled; at about the same time she had a "paralytic seizure"; right arm and left leg and back of neck affected. Difficulty in moving head and much pain. Walking power gradually returned but variable.

Condition, February, 1912: At times suffers from syncopal attacks;

patient has a choking feeling relieved by drinking hot water, and the face goes blue. At times actual loss of consciousness lasting two hours; "life has been despaired of." The attacks have increased in severity. All joints are more or less tender and stiff but not much swollen. Loss of muscular power in knees, flexion and extension limited. Right elbow and neck very tender. Typical rheumatoid condition of first and second metacarpo-phalangeal joints. Skin of four fingers glossy. Wrists puffy but move fairly well. Scarcely able to move head at all, features mask-like. Right arm practically useless. Teeth: many out, remainder infected at roots. Appetite fair. Tongue fairly clean. Digestion good. Pulse 76, regular. Bowels fairly regular. Sleep bad owing to pain. Treatment by continuous counter-irritation commenced in February, 1912. Patient had not been out of the house for four months when first seen by me, and a very gloomy prognosis had been given by six medical men in the Kensington neighbourhood. The heart was thought by them to be in an advanced state of fatty degeneration. Within a very short time after commencement of treatment by means of counter-irritation patient greatly improved. Regained power to write, sew, walk up and down stairs easily, &c. About a year ago was shown at a meeting of the West London Medico-Chirurgical Society and seen by a large number of medical men. Dr. R. L. Jones Llewellyn pronounced the case one of well-marked rheumatoid arthritis, the atrophy of the skin of the fingers being well shown and contributing to limitation of movement of the fingers. In spite of an attack of influenza and much domestic worry and stress, patient has become increasingly active and has practically ceased to have any syncopal attacks; she still has treatment from time to time.

Dr. PAUL CHAPMAN asked whether the improvement manifested was not possibly due to some psychological influence rather than to the direct effects of counter-irritation.

Rheumatic Nodules (*Rheumatismus Nodosus*) associated with Rheumatic Torticollis.

By F. PARKES WEBER, M.D.

THE patient, F. W., aged 11, is a pale, rather delicate-looking boy, with a certain degree of wry-neck, the neck being bent towards the patient's right with the chin turned a little to the left (fig. 1, from

a photograph taken on October 19). At present (November 1, 1913) there is no arthritis, nor does the boy complain of any pain or tenderness anywhere, but there is some puffiness about the second and third metacarpo-phalangeal joints in both hands, and over these joints very small rheumatic nodules can be seen and felt. There are moderate-sized rheumatic nodules over both elbows and both knees (patellæ), those over the knees being the largest and the most numerous (fig. 2). The

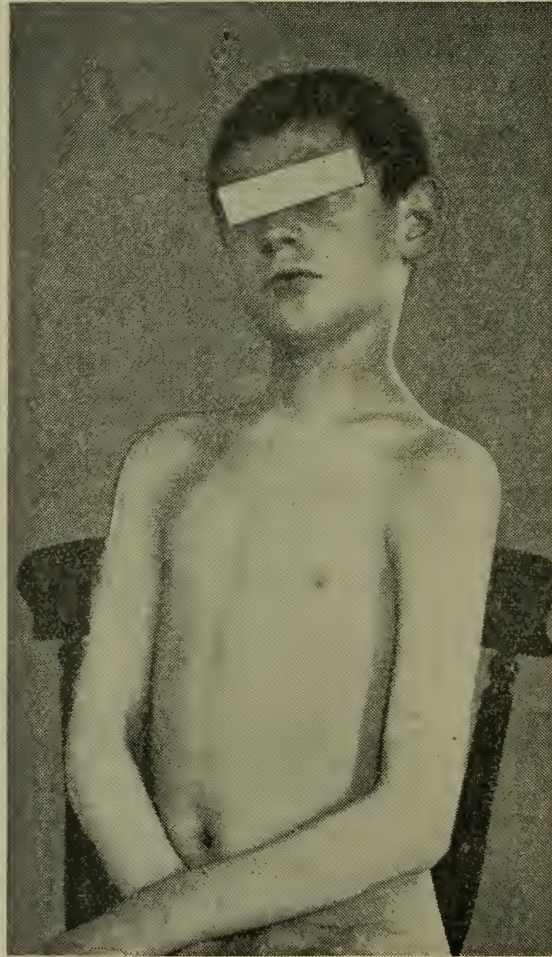


FIG. 1.

Showing the wry-neck.

olecranon bursa at both elbows is enlarged. The heart is excitable in action and the impurity of the first sound at the apex suggests slight endocardial changes at the mitral valve. In the absence of fever the frequency as well as the excitability of the heart's action suggest slight myocardial implication. There is likewise a variable systolic murmur to be heard over the "pulmonary area." Some of the lymphatic glands in the neck are a little enlarged.

The history is that the boy enjoyed good health until the present illness commenced on September 13, 1913, with pain in the left ankle; this joint became swollen on the following day. There was never any tonsillitis. He was treated by rest in bed and small doses of salicylates. At first there was fever up to between 102° and 103° F. This left him on September 20, but after September 24 to the middle of October there were occasional evening rises of temperature to about 100° F. Since then there has been no fever.

The wry-neck appeared at the end of September, and was at first accompanied by a little pain at the lower posterior part of the right

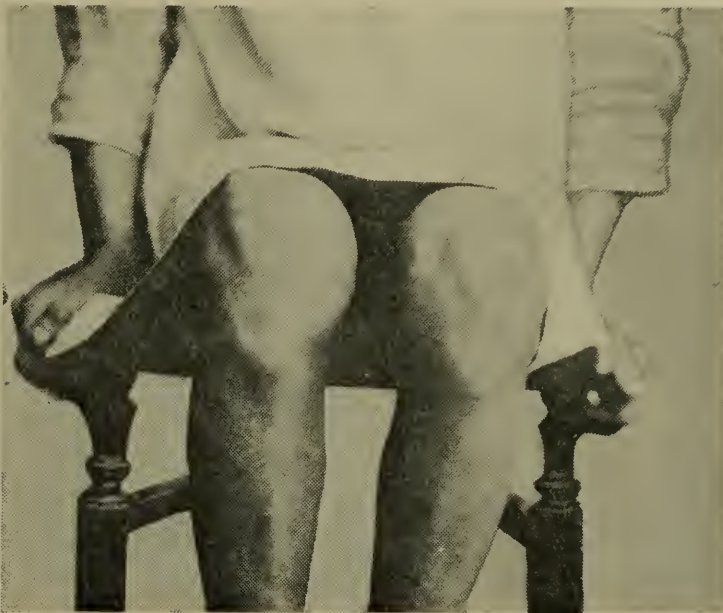


FIG. 2.

Showing the rheumatic nodules on the knees.

side of the neck. The rheumatic nodules were first noticed in the middle of October, at first only on the elbows and knees, later over the hands also. Recently he has been treated with subcutaneous injections of "Rheumatism Phylacogen" (Parke, Davis and Co.), and with careful massage of the neck. Röntgen-ray examination (skiagrams taken about the middle of October and again about the middle of November) shows no bony change in the neck. The bony prominence felt on the left side of the neck just below the mastoid region is evidently due merely to the wry-neck position of the cervical vertebræ. When the case was shown on November 14 the rheumatic nodules on the elbows and hands had become less marked, but those on the knees had, if anything, increased.

The wry-neck had not disappeared entirely. The phylacogen treatment had been accompanied by occasional very slight febrile reaction.

In regard to the family history, it may be stated that the boy's father died five years ago from pulmonary tuberculosis at the age of 39, and that the mother, aged 45, is living and well. Their four children are all living and the patient is the only one of them who is not well.

Similar "rheumatic torticollis," occurring after a mild attack of acute rheumatism, has not rarely been diagnosed as due to tuberculous caries of cervical vertebræ and treated accordingly.

The connexion of rheumatic nodules with rheumatic polyarthritis and Sydenham's chorea has of course long been recognized. Barlow and Warner, at the International Medical Congress at London in 1881, read a paper "On Subcutaneous Nodules connected with Fibrous Structures, occurring in Children the Subjects of Rheumatism and Chorea,"¹ a paper which was based on twenty-seven cases collected by themselves. H. Rabinowitsch, in an inaugural dissertation at Berlin in 1899, entitled "Beiträge zur Kenntnis des Rheumatismus mit Knötchenbildung (Rheumatismus nodosus)," collected accounts of fifty-two cases, of which forty-four were under the age of 20. If the German term "Rheumatismus nodosus" ("Nodular Rheumatism") be employed for this variety of rheumatism it must, of course, not be confused with the French "Rhumatisme noueux," which is a synonym for arthritis deformans. True rheumatic nodules are termed by the French "Nodosités rhumatismales sous-cutanées."²

One of the most elaborate and recent papers on the subject is that by Rosa Berkowitz in 1912,³ who based her conclusions on some personal observations and a large collection of cases from the literature. According to her statistics, cardiac complications (endocarditis, endopericarditis) are present in at least 88 per cent. of cases of nodular rheumatism in children. In all probability the present case is no exception to the rule that endocarditis generally accompanies rheumatic nodules, though the auscultatory signs are not quite decisive in the patient in question.

¹ Barlow and Warner, *Trans. Seventh Internat. Med. Congress*, Lond., 1881, iv, p. 116.

² Cf. E. Troisier, *Progrès Méd.*, Par., 1883, xi, pp. 947, *et seq.*, and 1884, xii, p. 3; E. Troisier and L. Brocq, *Rev. de Méd.*, Par., 1881, i, p. 297; E. Weill and L. Gallavardin, *Rev. Mensuelle des Mal. de l'Enfance*, Par., 1901, xix, p. 149; L. Gallavardin and F. Dela-anal, *Lyon méd.*, 1909, cxiii, p. 813.

³ Rosa Berkowitz, "Rheumatismus nodosus im Kindesalter," *Archiv f. Kinderheilk.*, Stuttg., 1912, lix, pp. 1-43.

The present case certainly conforms to the rule that the subjects of true rheumatic nodules are generally children who have passed through an acute or subacute rheumatic infection without being completely cured. The special interest in the case is, however, the association of the nodules with rheumatic torticollis, an association which one would expect to be not so very frequent, but which seems as yet to be unrecorded in the literature of the subject. Perhaps a true peri-arthritis *rheumatic fibritis*, analogous to the fibrositis which produces the rheumatic nodules, is the cause of the torticollis, which in the present case has¹ ceased during sleep, has not been intermittent, and has not been associated with any clonic or other spasms.

It is interesting that in 1878 H. Rehn¹ ended his summary of the local manifestations of acute rheumatism with a description of rheumatic wry-neck and the first two published cases of rheumatic nodules (P. Meynet's, of 1875, and one described by himself).

I have not thought it advisable to remove any of the nodules for histological examination. There have been quite sufficient observations of the kind on record, and the anatomical pathological findings have been quite recently dealt with in an excellent paper by Paul Frank.²

Angiokeratosis with Bony Changes.

By F. ESCHER, M.D.

THE patient, N. H., of Jewish parentage, aged 16, is a physically rather under-grown and undeveloped boy, mentally quite normal. His extremities tend to chilblains of the hands and feet and pinnae of the ears, which have a good deal of scarring. Owing to these cicatricial changes, the movement in some of the terminal finger-joints and in the toes has been very limited. On the hands (fig. 1) are a number of dirty spots which are minute warts on angiomatous (telangiectatic) skin.

¹ "Handbuch der Kinderkrankheiten," Tübingen, 1878, iii, part i, p. 21.

² P. Frank, "Ueber Angiokeratosis nodosus mit besonderer Berücksichtigung des pathologisch-anatomischen Befundes," *Berl. klin. Wochenschr.*, 1912, xlix, p. 1358.

to the cicatrization resulting from the chilblains. On the feet, in addition to the scarring of the toes from chilblains, there are to be observed a number of large hard "corns" (keratomata); some of these resemble the callosities which occasionally precede perforating ulcers. In the Röntgen-ray skiagrams (Dr. R. W. A. Salmond, July, 1913) of the hands and feet the terminal phalanges of the hands appear somewhat stunted, and there is slight general rarefaction of all the hand bones; in the feet there is marked deformity of the terminal phalanges, and there is more rarefaction of the bones than in the hands; the distal portion of the terminal phalanx of the left big toe has disappeared (fig. 2), as if by a process of absorption, like that



FIG. 1.

Photograph of the hands to show the minute angiokeratomata (appearing as dark specks). There are likewise cicatricial changes due to repeated attacks of ulcerated chilblains.

sometimes seen in Raynaud's disease. In spite, however, of the tendency to cyanosis of the extremities, the patient has never had any definite attacks of Raynaud's phenomena. The knee-jerks are exaggerated, but there are no signs of syringomyelia or other organic nervous diseases. Nor is there evidence of disease of any of the abdominal or thoracic viscera. Röntgen-ray skiagrams of the base of the brain show a pituitary fossa apparently of normal shape and size. The tuberculin test is negative (no reaction with 0.005 gm. of Koch's old tuberculin). The blood serum gives a negative Wassermann reaction for syphilis.

The chilblainy condition ordinarily associated with angiokeratoma of the hands and feet (angiokeratoma of the scrotum occurs in a different class of subject) seems to me insufficient in the present case to account for the bony changes revealed by Röntgen-ray examination; and yet there have been no definite attacks of Raynaud's phenomena nor local tuberculous disease to account for them.

In regard to the family history, there is nothing special to be noted except that his eldest sister (aged 24) has a good deal of hair on her chin and upper lip.



FIG. 2.

Skiagram of the toes, showing loss of bone in the terminal phalanx of the left big toe.

Hæmophilia.

By W. ESSEX WYNTER, M.D.

W. K., MALE, aged 22, a German, born in Saxony, not of Jewish descent, was admitted to the Middlesex Hospital on November 4, 1913, for hæmaturia. The family history was as follows: Paternal grandfather, now dead, had enjoyed good health; his wife is still living and healthy. There were two children. A daughter, married, with two healthy sons and two daughters, of whom one has recently died. A son (patient's father), whose wife's family history gives no clue to the disorder. Particulars of the mother's family are as follows: Her father died an old man. He had five brothers, but only remembered that the youngest died at 45 of "tumour." Her mother was an only child and

is still alive and well. The family consisted of three: The patient's mother and her two brothers, now aged 38 and 30, in good health, but without children. This history is unconvincing from the hæmophilia point of view owing to the relative absence of females. There were four sons, of whom patient is the youngest, and no daughters. The eldest and second are both alive and well. The third died at the age of 15. He was a bleeder. Patient remembers his once cutting his thumb, which bled for days and led to his being admitted to hospital. He also had, occasionally, swelling of joints which lasted some weeks. The patient himself had scarlet fever and measles as a child. Before he was aged 8 he partly remembers and has been told that he had frequently painful swellings in the knees which necessitated his staying in bed, but always cleared up eventually. When aged 9 patient had an attack of hæmaturia, unaccompanied by pain, which kept him in bed fourteen days. At the age of 16 he sprained his right elbow-joint slightly; great swelling ensued associated with pain and limitation of movement lasting fourteen days. Frequent similar attacks have occurred since, affecting the elbows, knees, and right shoulder. The attacks occurred particularly in the autumn. Two years ago, after the extraction of a tooth, bleeding continued for fourteen days. He was admitted to hospital for three days and oozing continued after his discharge. These are specific instances amongst many similar attacks of joint swelling and hæmaturia.

The present attack of hæmaturia commenced ten days before admission with slight coloration, which gradually became more intense. The following day there was an attack of pain shooting down to the groin on the right side and lasting half an hour. Swelling of the right elbow commenced a week before admission accompanied by stiffness and some redness, a similar attack having occurred a month previously. At the present time the patient is a healthy-looking youth with bright complexion and is well nourished. There is some swelling and limitation of movement in the right elbow and ecchymosis of the skin in the outer and flexor aspect. The urine is almost porter-coloured and opaque, specific gravity 1020, acid, and contains albumin corresponding with the blood. Corpuscles are present in quantity. An X-ray examination discloses no stone, nor any enlargement of kidneys. The organs appear quite normal, and apart from the hæmorrhage there is no sign or feeling of illness.

Case of Microglossia.

By B. C. MAYBURY, F.R.C.S.

(For W. H. BATTLE, F.R.C.S.)

E. D., A BOY, aged 18 months, was brought to the hospital in October, 1913, because he was unable to talk; he had been able to



Case of microglossia.

suck and swallow without difficulty. There are two other children who are quite healthy, and no other member of the family has been afflicted with a similar malformation.

On examination, the tongue is seen to be very small and to be tied down to the floor of the mouth; the maldevelopment is symmetrical, although the tongue is slightly displaced to the left side; the frænum is

represented by a stout cord which extends to the tip of the tongue. There is a large space round the edge of the tongue between it and the alveolar margin, at the bottom of which the salivary glands can be seen through the mucous membrane of the floor of the mouth. The tongue cannot be protruded; muscular movements are present but very limited. The mucous membrane appears normal. A complete investigation of its functions, however, cannot be carried out yet owing to the patient's age. The lower jaw is undeveloped and is overhung considerably by the alveolar margin of the superior maxilla. When first seen there was a small dermoid cyst in the posterior part of the soft palate in the middle line, but this has since ruptured, leaving a small scar.

As cases have been recorded in which patients have been born without a tongue, and have been able to talk, no operative treatment will be undertaken in this case.

Case of Myatonia Congenita.

By ARTHUR F. HERTZ, M.D., and W. JOHNSON, M.D.

A. D., AGED $3\frac{1}{2}$, has always appeared weak since birth. He is an intelligent boy, and he is able to talk quite well. He exhibits a general want of development and an extreme degree of atony of all the muscles of his body, no particular portion being worse than any other. Marked scoliosis is present (fig. 1). He has never been able to walk properly (fig. 2). His mother thinks that he is a little stronger than he was two years ago. At present he cannot stand without help. If made to sit up, his head cannot be held erect, but falls backwards. There is marked looseness in all the joints resulting from the atonic condition of the muscles. The arms and legs can be twisted into abnormal positions without causing discomfort (fig. 3). This is especially noticeable as regards the fingers, which can be bent backwards until the tips rest against the back of the wrist. The heels can also be put behind the neck. No tendon-jerks could be obtained in any of the limbs. No other members of the family are similarly afflicted.



FIG. 1.—Showing the extreme lordosis.



FIG. 2.—Showing the method of progression. One foot is tucked under the buttocks and by taking the weight on the hands the body is shuffled along.



FIG. 3.—Showing one of the extraordinary attitudes which can be painlessly assumed.

Case of Cervical Rib with marked Vascular Symptoms.

By ARTHUR F. HERTZ, M.D., and W. JOHNSON, M.D.

A. C., AGED 45, is by occupation a cook. Five years ago she began to suffer from numbness and coldness in the right hand, together with some loss of power. Later this was followed by pain along the inner side of the arm, and also to some extent over the front of the elbow-joint. The pain was gnawing in character, but occasionally became exceedingly severe for short periods, especially after the patient had been using the arm. It is now always worse at night, and the greatest



FIG. 1.

Case of cervical rib. Showing the atrophy in the inner half of the right thenar eminence.

ease is obtained by keeping the arm folded across the chest. The muscular atrophy which is most commonly associated with a cervical rib is well seen, the inner half of the thenar eminence being much atrophied (fig. 1), while the outer portion is unaffected and a deep groove separates the two. The hypothenar eminence and the interossei also participate in the atrophy. There is definite diminution of sensation over the little and third fingers as tested by pin-pricks. The vascular symptoms are exceptionally prominent. No pulse can be felt at the wrist, though one was certainly present a year ago. The fingers and hand are cold and blue in colour. The tips of all the fingers present a "dead" appearance. In the neck, just above the right clavicle, the subclavian artery can be both felt and seen pulsating so vigorously that at first an aneurysm might be suspected. The promi-

nence can, however, be recognized to be due to a cervical rib, which is easily palpable, and which is well shown in the accompanying skiagram (fig. 2) taken by Dr. Lindsay Locke.

[Since the case was shown a large cervical rib has been removed by Mr. E. C. Hughes, and now, sixteen days later, the pain has gone, but the radial pulse is still absent.]



FIG. 2.

Skiagram showing the cervical rib.

Case of Facial Palsy following a Mastoid Operation treated by Nerve Anastomosis.

By CHARLES A. BALLANCE, M.V.O., M.S.

F. M., FEMALE, aged 21. Admitted to St. Thomas's Hospital on March 17, 1913. One month previously she had been operated on for chronic otorrhœa in the country. Since this operation she had suffered from complete right facial palsy. On admission to St. Thomas's there was a foul discharge from the right ear and right facial palsy; all the muscles of the right side of the face gave the reaction of degeneration, and there was loss of taste over the anterior two-thirds of the right half of the tongue.

March 29: Complete mastoid operation performed. The descending part of the facial canal was found cut away for $\frac{1}{4}$ in.

April 11: Nerve-grafting operations performed. The proximal end of the divided hypoglossal nerve was sutured end to end to the distal end of the facial nerve, which was severed at the stylo-mastoid foramen. The proximal end of the divided descendens noni nerve was sutured end to end to the distal end of the divided hypoglossal nerve.

June 15: Symmetry of face at rest greatly improved. Right eye not so widely open and there is very little drooping of right angle of mouth.

July 15: Slight voluntary movement possible at right angle of mouth. No associated movement when the tongue is moved. Right side of tongue, which was much atrophied one month ago, is now not so markedly atrophic.

August 15: Strong voluntary movement possible at right angle of mouth, and both angles of the mouth move symmetrically in talking and laughing, though the left side moves a little more strongly than right. There are no associated movements of the angle of the mouth with movements of the tongue. The right side of the tongue is much plumper, and patient says she can taste on this side of the tongue. The right eye can be closed. All the muscles of the right half of the face can be voluntarily contracted except the frontalis. There is no deformity of the face at rest, and only a skilled person could detect any defect during the movement of the face. Mr. W. R. Bristow has supervised the electrical treatment of the paralysed face during the last two and a half months; galvanism has been applied for ten minutes and faradism for five minutes every day.

November 15: Since the last note further improvement has taken place; the two sides of the mouth move equally in smiling, but on close examination the right depressor anguli oris does not contract so strongly as that on the left side. There is distinct voluntary movement of the frontalis. All the muscles react to faradism, including the frontalis, but the reaction is not yet as strong as normal. The patient says taste is returning on the right side of the tongue. She is quite sure of this, but on testing no evidence of return of taste was found. The tongue can be protruded straight; the right half is nearly equal in bulk to the left.

Remarks.—The rapid recovery in this case is worthy of note. The muscles of the face and tongue will certainly completely recover from their previously paralysed condition. The sense of taste, too, according to the patient, is returning on the right half of the tongue.

The Treatment of Syphilis by Excision of the Primary Sore.

By ALBERT WILSON, M.D.

It was in 1880 that common-sense appealed to me to excise a hard chancre. The excision of the carbuncle of anthrax was followed by such excellent results that I was prompted to imitate the method. I argued—no chancre, no syphilis. Therefore, if a chancre existed, it seemed safest for the patient to remove it, as it is the focus of the disease. I published a short paper in the *Edinburgh Medical Journal*, about 1889, after treating some twelve or fourteen cases. In all I have done over forty cases, but regret not having regularly tabulated them, so I can only give general results.

At first I pursued the ordinary routine of mercury after the excision, but the patients themselves discontinued the treatment, so I adopted no other treatment than excision, avoiding all anti-syphilitic remedies except where secondaries had appeared, and then only till the secondaries disappeared.

The enlarged inguinal glands resolved gradually and if a rash or sore throat had appeared it rapidly subsided after excision. Thus I treated a case in 1912 with "606" one week after the chancre appeared. Wassermann's reaction was positive and spirochætes were found. There was a slight improvement at first. Ten weeks later I excised the chancre. At this time the inguinal glands on the side of the chancre were much enlarged; there was a roseola with ulcers on the palms; mucous plaques and fissures on the tongue. All symptoms subsided rapidly, but I also gave three injections of soamin. The patient has been very well, but the Wassermann reaction is now positive. I shall put him on treatment with arsacetin only.

I was in touch with the patients for a reasonable time afterwards, but in most cases for some years. One patient after twenty-two years was sound, married, and father of five healthy children. A similar story may be told of another patient who actually had slight secondaries, and so with some others.

I consider this method of treatment quite scientific. It can do no harm, and even if some spirochætes have got through the glands—the natural filter-bed and destructor—the infection will be less; for surely numbers must be of relative value in this disease as in tubercle?

The Treatment of Syphilis with Arsacetin only.

By ALBERT WILSON, M.D.

ARSACETIN (sodium para-acetyl-aminophenylarsinate=acetylarsanilate) is less toxic and I think more active than soamin (the sodium salt of aminophenyl arsonic acid). In a few cases where the patients declined excision of the primary sore I treated them with this drug alone. I will narrate these cases briefly:—

Case I.—S., aged 18. February 13, 1909: Had soft sores and one hard sore on the prepuce, which latter was fully developed in a fortnight. Bubo opened on February 21. A papular eruption appeared in March and a spreading ulcer on left leg in April. Chancre and leg healed early in May. Everything clear in July. He was treated with 5 gr. of arsacetin in water, injected into the buttocks every five or six days for three months. In December scabs and ulcers like rupia appeared on the buttocks, and for two months arsacetin was again injected. He was a heavy drinker. In 1911 and 1913 he had gonorrhœa. In 1912 he had syphilitic pityriasis about the scrotum, and again had a short course of arsacetin. Otherwise he had very good health.

Case II.—C., aged 56. A chancre appeared on the tip of the tongue in April, 1910. It was caught by smoking cigarettes prepared by a youth with an active chancre. He was first treated in June. The throat was also ulcerated, the glands enlarged, and there was a papular eruption. He received 6-gr. doses every five or six days for two months, and then every seven to ten days for three months. In six weeks the chancre was gone, but the glands continued enlarged for some weeks longer. He was a smoker, and in December returned with a large and painful swelling on the left side of the soft palate. This formed a gumma and abscess, even perforating the palate. In two months all was healed. The treatment by arsacetin was continued, using picric acid in alcohol and black wash locally. Treatment with arsacetin was kept up for eight or nine months, generally at a three weeks' interval. The patient, clinically, is in perfect health.

Case III.—R., aged 23. Coitus in June, 1910. A pimple on dorsum penis in August, which rapidly formed a large but not very hard chancre. The secondaries were very severe in the skin and continued for three months. The same arsacetin treatment was pursued, fifteen injections in all. In this case the skin lost all stains and became as soft and clear as in a child. Such a result I attribute to the arsenic. In February, 1911, iritis occurred in the left eye but disappeared after three injections. He has had five injections since, but not on account of fresh symptoms. He is in perfect health now. His Wassermann reaction is negative, so I will continue the arsacetin.

Cases IV and V.—Husband and wife. In May, 1910, the husband was cut in the lower lip by a barber's razor. In three weeks a small hard sore developed which he communicated to his wife. It appeared on her lip in a month, that is, at the end of July. He came to me early in September with sore throat and general papular rash. The lady had scaly papules in rings, healing in the centre, spreading on the outside. The scars of the chancres were very slight. Both patients were treated with 5-gr. injections of arsacetin, given at first every six days, then every ten to fourteen days. In all the husband had eighteen injections, while the wife had thirty injections, for her skin trouble persisted for several months.

Case VI.—N., aged 26. Came in 1910, about three months after the chancre appeared. He was severely affected with secondaries. Rash, throat, tongue, and later larynx. His tonsils were like two large chancres. The local treatment was dilute nitrate of mercury gargle, and painting with alcoholic solution of picric acid. The medicinal treatment was as in the other cases—injections of arsacetin. His was a difficult case, as he was very dissipated, and drank freely so that he had many relapses, especially laryngitis. The treatment was at first weekly, and then every two or three weeks, and was kept up for about a year, since when he has remained well (except for gonorrhœa). He was recently accepted, I am informed, as a first-class life and is now married.

Soft chancres clear up very quickly with arsacetin, but who can foretell the end of a soft chancre?

This brings me to congenital syphilis.

Case VII.—Miss N., aged 30 (1910), suffering from choroiditis in both eyes. Her father, aged 77, had a soft sore fifty years ago, and was treated for only one month by a recognized expert. He never had another symptom. This lady had been treated vigorously with mercury—getting steadily worse. She did very well on arsacetin. Her Wassermann reaction was positive before the treatment. It was negative in 1911 and 1913.

On the other hand, a girl, aged 13, with severe interstitial keratitis, did better on "606." She made a recovery in four months on the arsacetin treatment, but had a severe relapse, which only yielded to two injections of "606," 0.4 grm., though after sixteen months one cornea remains cloudy.

I have found arsacetin beneficial in tertiary cases—in tabes and in cerebral trouble. In one case where the patient contracted the chancre seventeen years ago, he had tabes, fits, attacks of loss of power to speak, which he timed to last between fifteen seconds and one and three-quarter minutes; also he had homicidal impulses towards his dearest friends. He had seven injections of "606," which he thought did him no good.

He obtained great benefit to his tabes by Dr. Queyrat's serum, which reduced his Wassermann reaction to 1. All his symptoms improved with arsacetin. Hence at his own request he has an injection every month. He walks better, sees better, has lost a very troublesome kind of flashing, is less depressed and no longer homicidal, and the halting speech has gone.

As to the question of Wassermann's reaction, most of my cases occurred previous to its introduction. We know, however, that "cured" negatives frequently relapse to positives, thus undermining our early impressions of the efficiency of "606." With this knowledge it is not necessary to apologize for the renewal, or the long continuance of the treatment by arsacetin. I gave small doses on account of the risks of arsenic. But possibly large intravenous doses might show arsacetin as a rival to "606." As to tertiaries, in none of these cases have I known of tertiaries following, and I have watched some of the patients for many years. It would be only according to ordinary statistics that a certain number of them should develop tertiary symptoms. As a matter of fact, I find the arsacetin more beneficial in tertiaries than iodide of potassium or mercury. As a rule, however, I give some mercurial treatment with the arsacetin. The above cases were treated with arsacetin alone, chiefly in order to test its value in syphilis. I think both these treatments merit consideration, in spite of the well-earned reputation of "606."

It is interesting to note that both the single men with positive Wassermann reactions have during the past year had frequent intercourse with two healthy females without infecting them. In another severe and neglected case, the patient did well on arsacetin after having had mercury and potassium iodide, married two years ago and has a healthy female child. His Wassermann reaction is at present positive.

Considering that actively progressing and even fatal cases of tertiary syphilis are frequently negative (cerebrospinal fluid?) and apparent cures are just as often positive, there appears to be a conflict between the clinical and the biochemical aspect of syphilis. The Wassermann test must remain under scrutiny for some years yet, until experience and experiment come into line together and the one corroborates the other.

Clinical Section.

December 12, 1913.

MR. CHARTERS J. SYMONDS, President of the Section, in the Chair.

Chronic Myelocytic Leukæmia treated by Benzol, &c.

By F. PARKES WEBER, M.D.

THE patient, B. L., aged 59, a Russian Jew, cabinet-maker, was admitted to the German Hospital under Dr. Parkes Weber on August 13, 1913. The spleen was hard and greatly enlarged, bulging forward and reaching downwards into the pelvis. The liver was also enlarged, the lower edge being three finger-breadths below the costal margin in the right nipple-line. The superficial lymphatic glands appeared unaffected, excepting for slight swelling of those in the groins. The blood-picture was typical of myelocytic leukæmia. The teeth and gums were in an unhealthy condition. The stomach contents after a test-breakfast were found to contain no free hydrochloric acid. In the hospital the patient did not seem acutely ill, though he was weak. Brachial systolic blood-pressure, 110 mm. Hg. Dr. R. Gruber (August 14) made an ophthalmoscopic examination and reported that the fundi were normal. The Wassermann reaction for syphilis and von Pirquet's cuti-reaction for tuberculosis were both negative. There was often slight evening pyrexia (about 100° F.) in the hospital until September 29, but since then there had been none.

With the exception of the present illness, which had lasted two years or more, the patient appeared to have enjoyed good health. As he had already been treated by Röntgen rays in another hospital, it was decided to make a trial of benzol-therapy, introduced by A. von Korányi and G. Királyi, of Budapest, in 1912.¹ In the present case gelatine

¹ See *Berl. klin. Wochenschr.*, 1912, xlix, p. 1357.

capsules were employed, each containing a mixture of 0.5 gm. benzol and 0.5 gm. pure olive oil. In this form the patient was given 0.5 gm. benzol three times daily from August 15 to August 23; from August 23 to September 2 the same dose five times daily; from September 2 to September 16, 1 gm. three times daily; from September 16 to October 20, 1 gm. four times daily. The benzol treatment was then discontinued, as it had led neither to decided objective nor to subjective improvement, and Röntgen ray treatment under Dr. James Metcalfe was immediately commenced. Since then the spleen had obviously greatly diminished in bulk and the quality of the blood had improved. On August 14 (before the commencement of the benzol-therapy) the blood examination gave: Red cells, 3,400,000 in the cubic millimetre of blood; white cells, 130,000 (of which the polymorphonuclear neutrophils constituted 45.2 per cent., and the myelocytes and myeloblasts 29.9 per cent.). On October 20 (when the benzol-therapy was discontinued) the blood examination gave: Red cells, 2,532,000; white cells, 219,000 (of which the polymorphonuclear neutrophils constituted 57.14 per cent., and the myelocytes and myeloblasts 25 per cent.). On December 2 the blood examination gave: Red cells, 5,350,000; white cells, 76,200 (of which the polymorphonuclear neutrophils constituted 55 per cent., and the myelocytes and myeloblasts 31 per cent.).

In addition to the treatment mentioned above, the patient, on August 25, was given (by intramuscular injection) 20 c.c. of fresh defibrinated blood from a healthy man, but this had no obvious therapeutic effect of any kind. The Röntgen ray treatment was carried out in the following manner: It was commenced on October 21 and was continued once a week afterwards. On October 21, October 28, and November 4, the X-rays were applied directly over the enlarged spleen anteriorly. On November 11 and November 18 they were applied to the spleen from the back and left side. On November 25 they were applied over the sternum, femora, and long bones of the arms. On December 2 they were applied again directly to the spleen anteriorly. At each séance a full Sabouraud pastille dose was given. The hardest kind (as most penetrating) of X-ray tube was used, the penetration being 8 to 9 on the Benoist scale; the rays were applied through 2 mm. of aluminium so as to filter out any soft rays left (in measuring the pastille dose the Sabouraud pastille was placed outside the aluminium filter).

DISCUSSION.

Dr. METCALFE wished to corroborate Dr. Weber's remarks on the efficiency of the X-ray treatment in the case before the meeting, but he wished to emphasize the necessity of a correct X-ray technique in the treatment of leukæmia. The X-ray tube should be of the hardest description, and the softer rays should be filtered out through a thick layer of aluminium (2 mm. thick). The dose should be a full measured Sabouraud dose, coloured, not before, but after the rays had passed through the aluminium. Dr. Metcalfe stated that he had seen marked improvement in a good many cases of leukæmia by X-ray treatment during several past years.

Dr. CALVERT said that since October 13 he had been treating with benzol in St. Bartholomew's Hospital a man suffering from chronic lymphocytic leukæmia. On October 13 the white count was 128,000. Since then it had gradually diminished and now it was 6,000. The spleen had become a little smaller and the patient was certainly much stronger and felt much better. He would report the case when the treatment was finished.

Dr. PARKES WEBER, in reply, said that arsenic was undoubtedly useful in some cases of leukæmia and could not be altogether neglected in favour of X-rays and benzol. He had once observed a case in which leukæmia seemed to have become quite quiescent. The patient was an old woman and showed no deficiency of red blood cells.

**Case of Suppression of Urine in a Boy, aged 11, after
Operation for Acute Appendicitis, cured by Double
Nephrotomy.**

By ARTHUR EVANS, M.S.

A BOY, aged 11, was admitted into Westminster Hospital at 10 p.m. on August 8, 1913; he was operated on the same night for acute appendicitis. The tip of the appendix was acutely inflamed and contained pus, which, as the appendix was being delivered through the wound, burst through the appendix wall and was caught upon a gauze pad; the pus did not foul the peritoneal cavity. There was a little free fluid in the peritoneal cavity; a rubber drainage-tube was inserted in the wound and reached to the site of the appendix; the rest of the wound was sewn up. As soon as the patient returned to the ward saline solution was administered *per rectum*.

August 9: The boy was sick twice. During the twenty-four hours 8 pints of saline solution were given.

August 10: During this day 10 pints of saline solution were given *per rectum*. No fresh abdominal signs manifested themselves; the drainage-tube was removed and a gauze plug inserted. The patient had by this time received 2 gr. of calomel in $\frac{1}{2}$ -gr. doses, and the bowels were moved twice.

August 11: Patient quite comfortable, the bowels were moved twice; the temperature reached 100° F. in the middle of the day, the pulse was 86, and the respiration 34; in fact, the condition was perfectly satisfactory.

August 12: At 2 a.m. the patient complained of pain in the left loin, and vomited three times. He was given 3 minims of oil of cajuput at 2 a.m. and 1 minim of tincture of iodine at 4 a.m. The pain got easier later in the morning. The feeds given consisted of lemonade, and milk with barley water; the boy was sick after each feed. At 11 a.m. the patient passed about 3 dr. of urine deeply stained with blood (the deposit obtained by centrifugalizing showed blood and bacteria, both bacilli and streptococci; there were no casts).

August 13: The patient still has some pain, and it is now in both loins. His colour is not good and the pulse is weak. No urine has been passed since 11 a.m. yesterday; to-day about 3 dr. were voided, looking like undiluted blood; this on being centrifugalized showed blood, pus, black pigment granules, oxalates, and a few large cocci; there were no casts. Hot fomentations to the loins have been continuous since yesterday. At 5 p.m. a hot pack was given, as vomiting was persistent. The boy seemed more comfortable until 7.30 p.m., when he had a convulsion—the face twitching and the eyes fixed; 2 pints of citric acid solution were given *per rectum*. At 8 p.m. the boy was unconscious and the pulse feeble; 3 pints of saline solution were given intravenously, and 2 pints *per rectum*. A hot-air bath was given. The skin did not get moist. 8.45 p.m.: The pulse became very feeble—was only just perceptible. At 9.20 p.m. the patient was taken to the operating theatre and I rapidly exposed both kidneys and freely laid them open, cutting through the substance of the kidney and exploring the pelvis in each case; no stone could be felt in either. Each kidney seemed to me much larger than normal, particularly the left, and each felt *tenser* than normal. From the left kidney I excised a small piece for microscopical purposes. Both kidneys bled profusely (as usual), and both were plugged with gauze packing. As far as the gush of blood

from the cut kidney would allow one to express an opinion, I did not find any urine in either pelvis. The patient was taken back to the ward and at 9.45 p.m. 10 minims of brandy were given hypodermically and 2 pints of saline solution administered subcutaneously.

August 14: At 12.15 a.m. the voluminous dressings had become sodden and needed packing; it was evident that urine as well as blood had soaked these first dressings. So profusely did fluid discharge from the kidney incisions that fresh packings were necessary at 3 a.m., 5.30 a.m., 6.30 a.m., 8 a.m., 9 a.m., 10.45 a.m., 1.30 p.m., 5.30 p.m., 7.45 p.m., and 11.30 p.m. The bladder was washed out at 11 a.m. The pulse was much stronger and the patient was quite comfortable; he did not vomit and there was no further convulsion.

August 15: The boy is much better and the pulse much stronger; he has slept fairly well, he has taken his food well, and has not vomited. The dressings were frequently changed.

August 16: At 3 a.m. the temperature rose to 102.6° F. The patient passed $2\frac{1}{2}$ oz. of urine *per urethram*; this was darkly coloured with blood. The bladder was washed out. At 12.30 p.m. $1\frac{1}{2}$ oz. of urine were passed; at 3 p.m. the temperature was 103.6° F.

August 17: The patient had a very good night; his temperature has fallen to 100° F. During the twenty-four hours he has passed 29 oz. of urine.

August 19: Under an anæsthetic I removed the gauze plugs from the kidney wounds and substituted others.

The remainder of the history is uneventful. The patient made an uninterrupted recovery.

Dr. R. G. Hebb, who has examined the portion of kidney removed at the time of the operation, reports: "Malpighian bodies large, and the capillaries engorged; in some there is a coagulum. The lumen of tubes is large, the lining cells are small and finely granular, the nuclei are normal. Some tubules contain a finely granular detritus, and others a homogeneous substance (possibly casts). The condition is of recent origin. There is no evidence of septic inflammation or of any growth. The kidney is in a condition of 'cloudy swelling.'"

I have only to add to these notes that the urine is now normal, hence we may assume that the urine was normal before the attack of appendicitis, and so it is clear that in this case we have been dealing with an almost fatal attack of suppression of urine in a patient whose kidneys were previously normal.

DISCUSSION.

Mr. W. G. SPENCER said that the patient exhibited by Mr. Arthur Evans would undoubtedly have died had he not operated. The same was the case in the patient he exhibited to the Section on May 31, 1912, who being the subject of chronic nephritis suffered from an intercurrent acute attack. He performed bilateral nephrotomy and established drainage thirty-six hours after the onset of suppression, and after the patient had had a third attack of convulsions. Mr. Spencer saw this patient not long ago, more than a year after; he was at work although presenting evidences of chronic Bright's disease, a cloud of albumin in the urine, hard arteries, pallor, and puffiness under the eyes. In such cases the kidneys were exceedingly vascular, and therefore, to avoid hæmorrhage, it was safest to thrust clamp forceps from the convex border into the pelvis and push in a drainage-tube along this track.

Dr. PARKES WEBER referred to experimental toxic suppression of urine in animals, and he wondered whether in such experimental cases the therapeutic effect of needling the kidneys (renal puncture), instead of the effect of nephrotomy, had been tried.

Mr. STANLEY BOYD asked why incision of the kidney and pelvis had been preferred to decapsulation.

Mr. ARTHUR EVANS, in reply, said he chose the operation of nephrotomy as it gave him the opportunity of examining the pelves of the kidneys, and also he considered that an incision through the substance of the kidney was likely to give more immediate relief than decapsulation. He had been so impressed by the immediate recovery of the patient, and also subsequently by reading the account of the cases operated on by Mr. Clayton-Greene,¹ that in a similar case he would not hesitate to incise and drain the kidneys.

Four Cases of Malignant Disease after Treatment with Radium.

By T. H. KELLOCK, M.C.

Case I.—H. R., aged 66, clerk. Admitted to hospital, July 20, 1913. Six weeks' previously he had first noticed an ulcer on the upper lip, caused, he thought, by a cigarette paper sticking to it; this had gradually increased in size, but had not caused him much pain. On admission the greater part of the upper lip was the seat of a hard-edged, rather deep ulcer, extending almost from one angle of the mouth to the other, and into the mucous membrane nearly to the junction of the lip

¹ *Proceedings*, 1911, iv, p. 161.

and alveolar margin of the jaw. Its hard, everted edge was clearly seen on the outside of the lip. There were no palpably enlarged lymphatic glands. The tongue was in a mild condition of chronic superficial glossitis. On July 25 a radium tube containing 82 mgr. of radium was inserted into the lip from the end of the growth, the inside of the lip and gum being protected by a thin lead plate 2 mm. thick, fixed in position by attachment to the teeth. The radium tube was left in for twenty-four hours. Marked inflammatory reaction followed, and a typical radium necrosis on the lower lip; all the hair on the upper lip fell out. Nothing further was done until October 1, when it was found that almost the whole of the growth had disappeared, leaving, however, a hard ulcer on the inner aspect of the lip towards the left side, and some induration around it. The ulcer was about $\frac{1}{4}$ in. in diameter and very superficial. On this day a tube containing 82 mgr. of radium was again inserted into this part and left in for eighteen hours. Inflammatory reaction was again marked, and a superficial ulcer appeared on the outer side of the upper lip. This took about a fortnight to heal, and at the end of that time the ulcer on the inside of the lip had disappeared. The condition at present shows still a little hardening towards the left side and a certain amount of scarring of the whole lip, but there is no ulceration, and the movements of the lip seem very little impaired. Microscopical examination: Squamous-celled carcinoma.

Case II.—F. P., aged 35, dispenser. First noticed his throat was sore and a swelling in the neck in January, 1913. In June, 1913, he attended at Bolingbroke Hospital, when a piece of growth was removed from the back of the tongue for examination. In the same month he was an in-patient at University College Hospital, where the growth was considered to be malignant and inoperable. Admitted to Middlesex Hospital, July 14, 1913, with a growth about the size of a walnut towards the left side of the back of the tongue, deeply ulcerated on the surface with hard edges. The mass was in contact with the soft palate and appeared to infiltrate the glosso-epiglottic fold on the left side. The movements of the tongue were impaired, and there was a good deal of difficulty in swallowing. The cervical lymphatic glands on the left side were markedly enlarged, they were very hard and only slightly movable; one enlarged gland could be felt on the right side of the neck opposite the angle of the lower jaw. On July 21, under an anæsthetic, 82 mgr. of radium were inserted into the base of the growth and left for fifteen hours. After a few days inflammatory reaction followed,

the soft palate and base of tongue being covered with a yellowish membrane. After a week a marked diminution in the size of the growth was noticed, and this continued until it had practically disappeared in fourteen days, and at the same time the glands in the neck became markedly smaller and more movable. The patient himself was quite sure that the circumference of the neck became much less. The reaction in mouth had disappeared in twenty-one days. At the end of September the patient was readmitted; there was then practically no sign of the growth in the tongue, but the cervical glands were still considerably enlarged. These were removed by operation on September 26; the whole of the chain on the left side and one gland on the right side being removed. The wounds healed by first intention, and the patient was discharged on October 8, shortly afterwards resuming his work as a dispenser. Now there is nothing to be seen or felt of the growth on the tongue, and the neck on the left side seems clear; there is, however, a little hardness about the scar on the right side of the neck.

Case III.—L. C., female, aged 50. The patient stated she had had a thin yellow discharge from the right ear for two years, but had had no pain until August of the present year, when a tumour began to grow at the meatus; then the discharge became less, but was stained with blood. She had only been deaf since the appearance of the growth. For about a fortnight before admission to the hospital (October 11, 1913) she had noticed that the right side of the face was weak. On admission a hard growth, about the size of a filbert, was found to be growing from the margin of the meatus of the right ear, involving the pinna and the skin in front of the ear. The surface was slightly ulcerated, and there was a foul-smelling discharge. There was no marked enlargement of the cervical lymphatic glands. The facial nerve on the right side was completely paralysed. On October 17 three tubes of radium, containing altogether 144 mgr., were inserted into the growth, and left in for twenty-four hours. The inflammatory reaction was not very marked. On November 11 she was readmitted, and it was then found that most of the mass of growth had disappeared, and in its place a small slough was visible at the upper part of the meatus, surrounded by an ulcerated surface from which there was a slight discharge. On the same day radium was again inserted in two tubes containing altogether 104 mgr. for twenty-four hours. Inflammatory reaction was absent up to the time of her leaving the hospital on November 15, and she has not been seen since. Microscopical examination: Squamous-celled carcinoma.

Case IV.—W. W., male, aged 55, licensed victualler, had been in the habit of smoking a clay pipe. About a year ago first noticed he had a sore on the lower lip; did not consult a doctor about it until November 12 this year. On admission to hospital (November 19) there was a typical malignant ulcer of the lower lip, situated a little towards the right side. The ulcer measured $1\frac{1}{8}$ in. in length by $\frac{5}{8}$ in. in breadth, the edges were very hard and there was slight discharge from the surface; the surrounding parts were not much affected but were covered with a thick brown crust. No enlargement of lymphatic glands was observed. On November 27, under local anæsthesia, a tube containing 82 mgr. of radium was inserted into the lip under the growth, the upper lip being protected by a thin sheet of lead. The tube was left in position twenty-one hours. Inflammatory reaction followed almost immediately. The condition now (fifteen days after insertion of the radium) shows that the greater part of the growth has disappeared, the lip still shows signs of this inflammatory reaction, being swollen and slightly ulcerated, so that there is little difference to be observed between the original situation of the growth and the rest of the lip. On the inside of the lip there is a marked condition of radium necrosis, the surface being covered by the usual yellowish membrane.

The microscopical specimens and photomicrographs of these cases were prepared and are exhibited by Mr. A. C. Morson.

DISCUSSION.

Mr. KELLOCK added that he was showing these four cases, not claiming them to be instances of the cure of malignant disease by the insertion of radium into the growth, but rather to illustrate the action of radium on such growths as were in a position to be easily observable. He expressed his great indebtedness to Mr. Lyster and Mr. A. C. Morson for their skilled and valuable assistance in the treatment of these cases. He remarked on the very rapid manner in which the growth in the tongue had disappeared after one insertion of radium and the immediate diminution in the size of the cervical glands, but the latter came to a standstill, and he then thought it right to remove them by a rather extensive operation. It was, at any rate, evident from these cases that whatever might be the subsequent history, the malignant growths had almost, if not completely, disappeared after the treatment, which was a distinct advance on any other form of treatment without operation, and made one hope that with further knowledge and experience a great deal might be done, in some parts of the body at any rate.

Dr. POYNTON asked, in a spirit of honest inquiry, whether Mr. Kellock thought the radium action was simply that of a caustic, or was in any way specific. Bearing upon this he thought the behaviour of the lymphatic glands was of interest. Did they, when the radium was applied, show at once signs of diminution or did they diminish as a result of the destruction of an infecting focus? If the former occurred it would seem to point to more than a caustic action. Lastly, he supposed there was a "striking" distance for the radium, and was this known approximately, and how best guarded against in the case of healthy tissues?

Mr. A. CLIFFORD MORSON stated that for some months he had been carrying on an investigation in the research laboratories at the Middlesex Hospital into the changes which take place in the cells of epitheliomata when exposed to the gamma rays of radium. He found that within twenty-four hours of the commencement of treatment the malignant cells in the immediate vicinity of the tube of radium completely degenerated. In the region of the growth, where the intensity of the rays was less, the cells were also profoundly altered. Their normal arrangement disappeared. In places the malignant mass was broken up into isolated groups of cells, the nuclei of which were irregular in shape, some even being split into one or more fragments. If portions of the tumour were removed two or three days later, further changes were noted to have occurred. The connective tissue cells had commenced to proliferate, and those malignant cells which had escaped immediate death showed apparent vacuolation with greatly enlarged nuclei. With regard to the microscopical appearance of the growth in the lymphatic glands secondary to the tongue (Case II), it was possible that the difficulty in diagnosis was due to the changes which had taken place in the malignant cells, following the disappearance of the primary tumour from the radium treatment.

Case of Congenital Heart Disease and Hemiplegia.

By F. S. PALMER, M.D.

R. R., AGED 22, recently under treatment as an in-patient at the West End Hospital, Welbeck Street. She has always been blue so long as she can remember, and suffered from shortness of breath on the least exertion; but she went to school in the usual way, and no special care seems to have been taken of her as regards the heart trouble. She had scarlatina at the age of 6 (not severe), acute rheumatism at the age of 17 (lasting six weeks) and a second attack at the age of 19 (duration three weeks). In March, 1912, she had an attack of hemiplegia of sudden onset on the left side, involving the facial muscles. She was

aphasic for a fortnight and then recovered her speech. Before the hemiplegia attack she was left-handed, but she now uses both hands equally well. After her admission to the hospital she had such alarming syncopal attacks and cardiac dyspnoea that it was necessary to keep her in the recumbent position for nearly two months. Under treatment she has steadily improved in health, but she still walks with a slight limp, and there is some weakness of grasp in the left side. The points of interest in the case at present appear to be as follows:—

(1) The degree of cyanosis, probably from birth, with remarkable clubbing of the fingers and toes, and polycythæmia.

(2) The cardiac impulse (without any definite thrill now) can be felt best during active respiration about the sixth intercostal space in the anterior axillary line. Percussion and skiagrams show no enlargement of the heart to the right, but the organ is generally increased in size and apparently lying with its long axis on the diaphragm. A loud, harsh murmur can be heard with its maximum intensity about the junction of the third left costal cartilage with the sternum, which occupies the whole period between the first and second sounds, ending sharply with the latter. The murmur is well heard over the sternum in that position, but it is not audible over the whole of the cardiac area, nor is it conducted up into the neck. Nothing can be heard at the back, and there is no evidence of any pulmonary or renal complication. The absence of any other physical signs in the heart and large thoracic arteries at the present time points to some kind of congenital malformation with possibly superadded rheumatic endocarditis, or endo-pericarditis, as an explanation of the apparent hypertrophy of the left ventricle.

(3) The hemiplegic symptoms have to a great extent disappeared. She uses her left hand, and writes unusually well with it when requested. Her deep reflexes are equal but slightly increased, and the plantars are flexor on both sides.

Dr. PARKES WEBER thought that the diagnosis of pulmonary stenosis was not sufficient to account for the attack of cerebral embolism. There had probably been some disease (endocarditis) on the left side of the heart also, at all events about the time when the cerebral embolism occurred.

Latent Fracture of the Patella.

By W. G. SPENCER, M.S.

THE patient is exhibited six months after the union by wire of a transverse fracture of the left patella, along with the photographs taken after the fracture, and after the union. He sustained a sub-aponeurotic fracture from slight violence, after which he was able to walk 9 miles and again 15 miles, also to go up and down stairs frequently until a week after the fracture, when, in stepping down one step, the aponeurosis tore widely, with separation of the fragments.

A male, aged 46, struck his left knee against the iron rim of a barrel, which first caused numbness, then a little pain, followed by some puffiness, but no bruising. Two days later, thinking to get rid of rheumatism, he walked 9 miles, and, five days later, 15 miles, at the end of which he felt his injured knee giving out. As he was entering a house he had to go down two steps; at the first he bore on his sound leg, at the second step he put down his injured leg, which suddenly gave way and he fell to the ground. On being raised he found that he could bear no weight on the limb, and the knee rapidly swelled. He was seen by Dr. Redmond Roche, and a photograph, taken by Dr. J. Allpress Simmons, demonstrated a transverse fracture of the patella, the fragments being separated by at least 2 in. I united the fragments by silver wire ten days after the first accident; there was much blood-clot in the joint, the patella had been divided across the middle as cleanly as if cut with a knife, and the aponeurosis had been torn completely across, nearly out to the lateral ligaments. After the union there was some synovitis for a time, but this has subsided and his limb is now sound.

Case of Cleido-cranio-dysostosis, with Signs pointing to Pressure on the Brachial Plexus by the Rudimentary Right Clavicle.

By F. J. POYNTON, M.D.

GIRL, aged 19. Both clavicles have never been properly formed. The fontanelles were very late in closing (about the age of 17). No family history of importance except that the mother had myxœdema about the time the girl was born. For the last five weeks patient has

had shooting pain in the inner side of the arm and the front of the chest and the right side ; these have been getting worse. The fontanelles are now closed. The teeth of the upper jaw are very irregular and ill formed. Both clavicles are imperfectly ossified, each being in two pieces. The right arm shows a diminution in pulse when the shoulder is depressed and there are areas of hyperæsthesia on the inner side of the arm and the front of the chest.

The main point at present is the question of the pain and the appropriate treatment.

The case was reported in the *Lancet* (1907, ii, p. 1599) by Dr. Spriggs.

Case of Swelling of the Upper Jaw.

By T. B. LAYTON, M.S.

W. B., AGED 18, has noticed the swelling on his face for two months. The teeth are all present with the exception of the third molars, and as



[Showing the fang of the lateral incisor apparently projecting into the cyst.
At the operation this was proved not to be so.

none of these are milk teeth no unerupted teeth are likely to be present in the front of the jaw. Mr. J. S. Cocks has examined them with the hot and cold tests and finds them all alive, nor can he find any evidence of caries, but reports that there is an acute pulpitis of the left lateral incisor. On transillumination the right side is opaque, the left is

markedly translucent. A photograph by Mr. C. H. Achner is also shown. On the left side there is a swelling of the maxilla, which bulges on to the face, the anterior two-thirds of the palate, and the inferior meatus of the nose. Externally it is oval and passes up to the infero-mesial quadrant of the orbital margin, but above this the nasal process is felt to be of its normal shape. In the mouth, the swelling does not cross the mid-line; the alveolar margin is expanded and not thickened; at the reflection of the mucous membrane from gum to cheek, in the space between the second premolar and first molar, is a circular area of $\frac{1}{4}$ in. diameter where there is no osseous tissue to the wall of the lump. Above and behind this the zygomatic process of the maxilla can be felt. The crowns of the lateral incisor, the canine and both premolars are rotated inwards.

[*Subsequent History.*—The cyst, which contained serous fluid in which was much cholesterin, was removed under general anæsthesia through an incision in the mucous membrane. When the cyst had been removed the fang of the lateral incisor and anterior buccal fang of the first molar were exposed in the bony cavity, but there was no evidence of any dental origin to the cyst, for no fang was adherent to the wall nor protruded into the cavity. The mucous membrane of the floor of the nose was exposed, the maxillary air sinus was not opened, the bony wall between this and the cyst being still intact.]

Clinical Section.

January 9, 1914.

Mr. CHARTERS J. SYMONDS, President of the Section, in the Chair.

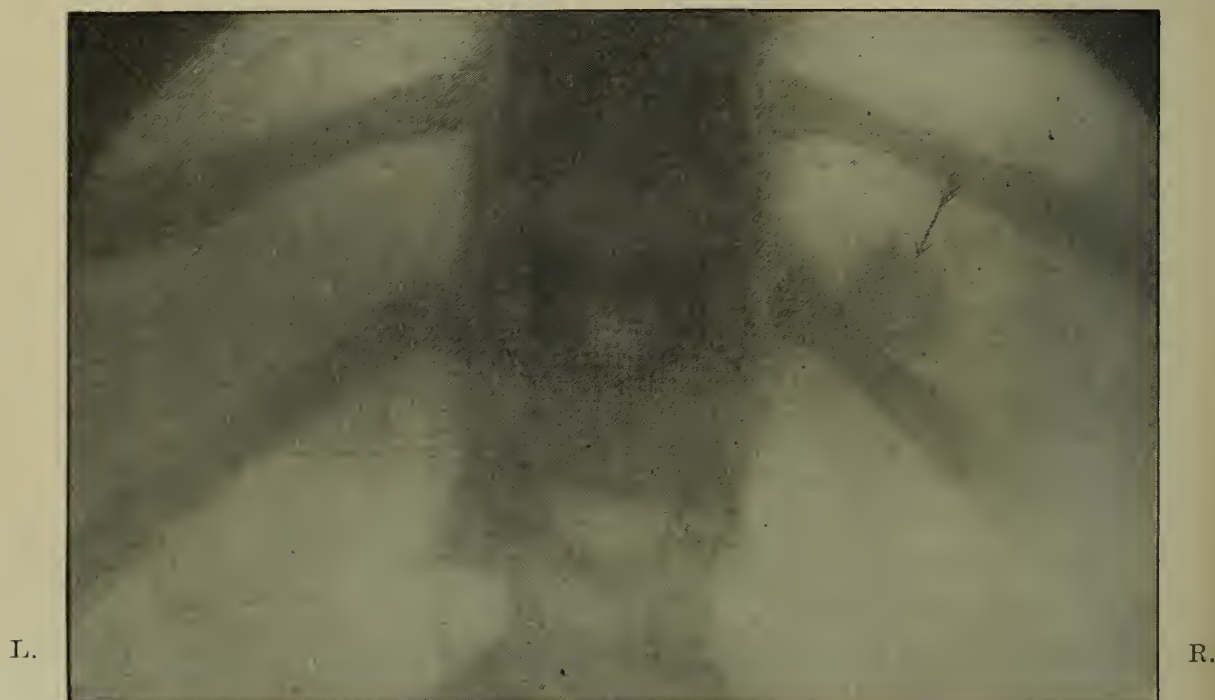
Addison's Disease in a Boy, with Calcification of the Adrenals.

By H. D. ROLLESTON, M.D., and E. J. BOYD.

THE patient, aged $12\frac{3}{4}$, was bright, intelligent, and fair-skinned until about the end of October, 1913, when his skin was noticed to be brown; this was at first attributed to dirt and an attempt was made to wash it off. When this attempt failed it was thought to be due to his habit of drinking vinegar. Synchronously with his change in colour he lost all his energy, was inclined to sleep all day, very easily got tired, had a cough at night and nocturnal enuresis. There has not been any gastrointestinal disturbance or fainting attacks. Except for chicken-pox some years ago the patient has not had any illnesses. An uncle and a brother are said to have had tuberculosis. The other children and the parents are fair.

On admission the boy had a somewhat lifeless, sleepy, sunken-eyed appearance and a general bronzing of the skin, especially around the nipples and pudenda. There is a pigmented scar in the left groin, and the back and abdomen show a few scattered spots of pigmentation. There is no buccal pigmentation. There are no signs of pulmonary or spinal tuberculosis, and von Pirquet's reaction was negative on two occasions. The systolic blood-pressure in the arms varies between 64 and 84 mm. Hg. There is no valvular disease of the heart. There is no dullness behind the manubrium sterni.

Skiagraphy: Dr. Stanley Melville reports—"Very definite calcareous particles in the region of the last rib and suprarenal body on the right side, less definite on the left side. The heart is small and vertical. There are discrete and dense opacities at the hila of the lungs, suggesting calcified nodules. The movements of the diaphragm were feeble, but the expansion and translucency of the apices normal."



Case of Addison's disease. On the right side the arrow points to a distinct shadow formed by calcareous particles. On the left side the shadow is less definite.

BLOOD COUNTS (BY DR. S. WYARD).

December 11, 1913.

Reds	...	...	...	...	...	...	6,492,000
Hæmoglobin	...	...	...	...	...	...	80 per cent.
Colour index	...	...	...	...	...	...	0·6
Differential count of leucocytes :—							
Polymorphonuclears	...	...	...	...	...	...	33·5
Eosinophiles	...	...	...	...	...	...	7·0
Lymphocytes (large)	...	...	...	...	...	...	14·5
„ (small)	...	...	...	...	...	...	40·0
Hyaline	...	...	...	...	...	...	3·5
Transitionals	...	...	...	...	...	...	1·5
							100·0

The red cells are normal in size, shape, and staining.

BLOOD COUNTS (BY DR. S. WYARD)—(continued).

December 22, 1913.

Reds	...	...	...	...	...	...	5,300,000
Hæmoglobin	...	...	...	...	...	...	75 per cent.
Colour index	...	...	...	...	...	...	0.73
Leucocytes	...	...	...	...	...	...	23,000
Differential count :—							
Polymorphonuclears	...	...	...	...	...	...	48.5
Eosinophiles	...	...	...	...	...	...	6.5
Lymphocytes (large)	...	...	...	...	...	...	11.5
„ (small)	...	...	...	...	...	...	28.5
Hyaline	...	...	...	...	...	...	2.0
Transitionals	...	...	...	...	...	...	3.0
							100.0

December 30, 1913.

Reds	...	...	...	...	...	...	5,200,000
Hæmoglobin	...	...	...	...	...	...	68 per cent.
Leucocytes	...	...	...	...	...	...	21,000
Differential count :—							
Polymorphonuclears	...	...	...	...	...	...	60.0
Basophiles	..	...	...	...	...	...	0.5
Eosinophiles	...	...	...	...	...	...	4.0
Lymphocytes (large)	...	...	...	...	...	...	15.5
„ (small)	...	...	...	...	...	...	16.5
Hyaline	...	...	...	...	...	...	1.0
Transitionals	...	...	...	...	...	...	2.5
							100.0

On January 9, 1914, the red blood cells were 6,400,000 per cubic centimetre.

A high lymphocyte count has been thought to indicate concomitant lymphatism, and therefore to be an ominous sign. An increased number of red blood corpuscles is occasionally seen in Addison's disease, and various explanations have been offered. It has been thought to be due to concentration of the blood from vomiting or diarrhœa, neither of which occurred in this case. A specific action of tuberculous toxin has been invoked, and G. R. Ward¹ has described the process as compensatory, and argues that adrenal insufficiency gives rise to circulatory stasis, which, in its turn, causes concentration of the blood and actual increased blood formation.

Treatment : Rest in bed and adrenalin chloride solution (1 in 1,000), 10 minims in water three or four times daily by the mouth.

¹ G. R. Ward, *Proc. Roy. Soc. Med.*, 1913, vi (Med. Sect.), p. 55.

Splenectomy for Chronic Acquired Acholuric Jaundice with Splenomegaly.

By SIDNEY BOYD, M.S.

A. H., MALE, aged 22. No family history or previous illness of importance. Present illness began in August, 1909, with lassitude, loss of appetite, indigestion, with occasional vomiting, especially after fatty foods, frontal headache, giddiness, especially on stooping, and slight icteric discoloration of the conjunctivæ and skin. Jaundice has persisted more or less since the onset and always became worse after exertion. The urine was dark in colour and the stools were said to be light-coloured. Eighteen months ago patient was admitted into a hospital in London, when the gall-bladder was explored and drained, with a negative result, the jaundice persisting.

Patient first came under my observation in August, 1913, and was found to be a fairly well developed and well nourished young man. There was slight icteric tinging of the skin and conjunctivæ. The spleen was enlarged, extending two fingers' breadth below the costal margin. The liver edge could be felt just below the right costal arch and was rather firmer than normal. The other viscera were healthy. Teeth in good condition; tongue clean. Motions of normal colour; urine dark reddish-brown in colour, specific gravity 1015, acid, contained an occasional trace of albumin, no sugar, blood, or bile. On August 25 the red blood cells numbered 4,200,000 per cubic millimetre, white cells 5,900, hæmoglobin 80 per cent., colour index 0·95.

On August 31 the blood was examined by Dr. S. H. Browning, who reported as follows: Total reds, not done; hæmoglobin, 96 per cent.; white cells, differential count (500 counted)—polymorphonuclears, 70 per cent.; lymphocytes, 28 per cent.; large mononuclears, 1·2 per cent.; eosinophiles, 0·8 per cent.; mast cells, 0. From the appearance of the films there is some polymorpho-leucocytosis. Red cells vary considerably in size; some polychrome staining. No normoblasts were seen. Some poikilocytosis. Films stained by Pappenheim's method showed granules in some red cells and some slight reticulation. The blood serum is quite greenish-yellow and gives all the reactions for bile pigment. The blood, unfortunately, underwent auto-hæmolysis before I had the chance to spectroscope it. The relation between

serum and clot was very abnormal, about $7\frac{1}{2}$ c.c. of serum in 10 c.c. of blood. Wassermann's reaction positive.

Fragility of red cells: Hæmolysis at once in 0.1, 0.15, 0.2, 0.25 per cent. saline; at end of one minute in 0.3 and 0.35; at half an hour in 0.4; and at one hour a trace of hæmolysis in 0.45; at end of two hours no further hæmolysis had taken place.

Control: Hæmolysis at once in 0.1, 0.15, 0.2, 0.25 per cent.; at end of one minute in 0.3 and 0.35; in 0.4 in fifteen minutes; no further hæmolysis in two hours.

Result: Very slight increase of fragility in patient, $\frac{0.45}{0.4}$.

Patient was kept under observation in bed for four weeks. The jaundice was found to vary from day to day, and with each exacerbation he became drowsy and complained of headache and general malaise. A slight attack of tonsillitis lasting a few days caused some elevation of temperature, which was otherwise subnormal.

Operation (September 8, 1913): Preliminary hypodermic injection of morphine, scopolamine, and atropine. Inhalation anæsthesia by open ether. Splenectomy was performed through a vertical incision near the outer edge of the left rectus. The spleen was delivered out of the wound, there being no adhesions to the diaphragm. The gastro-splenic omentum was divided close to the spleen between several pairs of forceps and ligatured. The splenic vessels between the two layers of the lienorenal ligament were then similarly treated, being divided also close to the spleen. The wound was closed in layers without drainage. There was hardly any shock; very little vomiting and no hæmatemesis followed. Convalescence was rapid.

On the third day after the operation the jaundice was noticed to be very much less; at the end of a week the sclerotics had lost their icteric tinge and the urine was normal in colour. Patient expressed himself as feeling very much better, having lost his headache and drowsiness and digesting his food well.

Second report on blood by Dr. Browning, October 8 (one month after splenectomy): The Wassermann reaction is now quite negative and I have little doubt that the positive reaction was due to the excess of bile in the blood serum. The fragility of his red corpuscles is the same as before, practically normal. The blood has not hæmolyzed of its own accord up to the present (eight days). Hæmoglobin, 100 per cent. Differential count normal. Character of blood cells normal. As far as I can observe his blood altogether seems normal.

PATHOLOGICAL REPORT BY DR. A. G. GIBSON.

Report on half spleen sent preserved: The external shape of organ is normal, and the size about twice that of the adult spleen. Its surface is slightly roughened, but the capsule is not definitely thickened. On section it is dark brown in colour, and the Malpighian bodies are marked though not increased in size or number. The trabeculæ can also be seen. Small darker points can be seen here and there and suggest thrombosis in the smaller vessels; some of the larger vessels are definitely thrombosed.

Microscopically, the organ is highly cellular. Malpighian bodies are present, and the larger trabeculæ are thickened. Red and white clot can be seen in some of the larger veins. In the more cellular parts are numerous lymphoid channels lined by a simple but not always regular epithelium. General fibrosis is not marked. Everywhere in the sections can be seen pigment granules, mostly extra-cellular. There are no hæmorrhages to be seen, either in the neighbourhood of the trabeculæ or in the pulp. In the walls of a few thickened arterioles, out of a large number examined, were several thin, long, unbranched threads appearing black when stained by Wheal and Chown's method; none of these, however, though suggestive of a parasitic invasion, could be found to possess any features which could be taken as proof that these were mycelial threads. Some of these threads have been found in the pulp.

REMARKS.

The case is one of chronic acholuric jaundice, clearly of a hæmolytic nature, and in the absence of any family or congenital history it must be grouped under the "acquired" type. Of special interest are: (1) The (practically) normal fragility of the red cells in saline solution; (2) the remarkable changes in the blood which followed the operation, including the conversion of a positive Wassermann reaction into a negative one; (3) the futility of drainage of the gall-bladder in these cases; and (4) the immediate and beneficial effect of splenectomy.

The case bears considerable resemblance to two other published cases:—

(1) Banti's case, called by him "hæmolytic jaundice."¹ This

¹ *Il Policlinico*, Roma, 1911, xviii, p. 1558.

patient had anæmia, jaundice, and an enlarged spleen. Splenectomy was performed and the case did well. Pathologically, the spleen is described as exhibiting no variation of structure, but pure hyperplasia with enlargement of glands at the hilum. There was evidence of erythrocytic destruction in the spleen and in the glands. Banti lays stress in his article upon the following points as being characteristic of hæmolytic jaundice: Slow onset of anæmia, bilirubinæmia, urobilinuria, diminution in red cells and in hæmoglobin, increased fragility of red cells, poikilocytosis, presence of normoblasts, absence of myelocytes, leukopenia, and irregular fever.

(2) Micheli's case.¹ An abstract of this case is given by Dr. French in the *Medical Annual*, 1913, p. 456. Micheli designates the case as one of hæmolytic splenomegalic jaundice of the Hayem-Widal type. The patient was a man, aged 22, suffering from lassitude, anæmia, weakness, an icteric tinge, and progressive deterioration in his general condition; no pain or gastro-intestinal symptoms. Medical treatment for three years had no effect. The spleen extended two fingers' breadth below the umbilical plane. The liver was enlarged and extended two to four fingers' breadth below the ribs. The urine contained no bile pigment, but an increased, although variable, amount of urobilin. Fæces were normal. The blood contained from 980,000 to 2,600,000 red cells per cubic millimetre, and from 4,000 to 5,000 whites. Pronounced polychromatophilia was present. The red cells hæmolyzed readily. Wassermann's reaction was negative. Blood serum contained bile pigment. The spleen was excised and a good recovery followed.

I wish to express my indebtedness to my colleague Dr. F. G. Crookshank for much help in dealing with this case.

DISCUSSION.

Dr. H. D. ROLLESTON believed that the first case of successful splenectomy in hæmolytic jaundice, though it was long before the condition was fully recognized, was by the late Sir Spencer Wells² in 1888. The patient, a female, aged 24, had a large abdominal tumour, which came below the umbilicus on the left side and was regarded as a uterine fibromyoma. She had had attacks of jaundice since the age of 9, in one of which she had been seen by Dr. P. W. Latham at Cambridge. Laparotomy proved that the tumour was a large spleen with a very long and fatty pedicle composed of the gastro-splenic

¹ *Wien. klin. Wochenschr.*, 1911, xxiv, p. 1269.

² Wells, *Med.-Chir. Trans.*, 1888, lxxi, p. 255.

omentum. Splenectomy was followed by freedom from the attacks of jaundice. In Mr. Boyd's case the thrombosis of the intrasplenic veins appeared to be an attempt to anticipate the curative effect of splenectomy, for this process would tend to exclude that organ from the portal circulation. It was noticeable that splenectomy cured or benefited several diseases of quite different natures, such as chronic hæmolytic splenomegalic jaundice, chronic splenic anæmia and its sequel, Banti's disease (or the complication of secondary hepatic cirrhosis), and primary massive tuberculosis of the spleen. The manner in which cure or benefit was induced would be an interesting subject for discussion at the next meeting of the Section, for it was not always clear how this was effected; an instance in point was Dr. S. Coupland's¹ classical case of supposed splenic anæmia, in which much benefit followed splenectomy, but two years later the patient died with ascites and hæmatemesis, and the necropsy showed a syphilitic liver.

Dr. WYNTER remarked in connexion with the case he had recently exhibited that the condition was congenital and the Wassermann reaction negative. He had seen the patient that afternoon and she continued perfectly well and was about to marry, now a year after the splenectomy.

Dr. F. PARKES WEBER remarked that the blood condition in the case previous to operation was not quite typical of cases of chronic acholuric jaundice with splenomegaly of the hæmolytic "Chauffard type." In such cases increased fragility of the red cells towards hypotonic saline solution was a marked feature, and there was generally excessive anisocytosis without much poikilocytosis, and there was likewise much polychromatophilia.

Cases of Pulmonary Tuberculosis after Gymnastic Treatment.

By F. SYLVAN, M.D.

Case I.—W. P., a man, aged 32, shown at the meetings in January and March, 1913. During the autumn of 1911 he began to feel weak, and in November of the same year he had a hæmorrhage (about a teacupful of blood). In October, 1912, he had another hæmorrhage and went to Brompton Hospital, where the diagnosis was pulmonary tuberculosis of upper lobes (both sides), and tubercle bacilli were found in his sputum. He was recommended to go to a sanatorium. On November 26, 1912, he started gymnastic treatment. Over upper part of right lung dullness on percussion; over upper lobe fine râles, over middle lobe crepitation, over lower lobe prolonged expiration; over

¹ Coupland, *Brit. Med. Journ.*, 1896, i, p. 1445.

upper part of left lung dullness on percussion; upper lobe crepitation with few râles, lower lobe prolonged expiration. Vital capacity 1,860 c.c. At the meeting the following March the patient was again shown. The vital capacity had increased to 3,390 c.c. He has since kept well. Ever since he started gymnastic treatment he has continued his work. This case shows that a patient in advanced stage of pulmonary tuberculosis can be treated by gymnastic treatment without leaving his work.

Case II.—W. G., a man, aged 25, shown at the meetings in March and May, 1913. At Easter, 1912, he got a very bad cold and cough, and expectoration increased gradually. During January, 1913, he got much worse. Having before lost 1 st. he now lost another stone in three weeks and was quite unfit to do any work. He started gymnastic treatment on February 13, 1913. Left lung, dullness on percussion; under clavicle, slight cracked-pot sound; râles all over. Right lung, râles behind the shoulder-blade. Vital capacity, 264 c.c. At the meeting last May the patient was shown as fit for work, there being no active signs of the disease. The vital capacity had increased to 1,590 c.c., and the patient, in the exhibitor's opinion, would remain fit for work, judging from similar cases under gymnastic treatment. An opinion was expressed that this patient would soon break down again, having a huge cavity in the left lung. At the end of May his inspiratory power was 62 mm., his expiratory 80 mm. In July he got a situation with longer hours and somewhat heavier work than he had when he became ill. He is now, after having been at work about six months, stronger than he was when he started work.

Dr. ALEXANDER SANDISON said it would add to the value of the demonstration of these cases if Dr. Sylvan would let them know how many cases he had treated in this way, and what had been his general results. The method, in theory, seemed little different from the ordinary graduated exercises of the modern sanatorium, but the practice was strikingly out of accord with accepted views, since Dr. Sylvan apparently paid little attention to the temperature range of his patients and prescribed these exercises regardless of pyrexia. So novel a use of exercise in treating consumptives required the support of a considerable series of successful cases, especially when it was remembered how frequently isolated cases of apparent "cure" of phthisis were found after the most varied forms of treatment.

Case of Excision of the Shoulder performed Fifty Years ago.

By HENRY CURTIS, F.R.C.S.

H. R., AGED 64½, pensioner. In 1861, when aged 12, he suffered from an abscess behind the right shoulder and was seen by the late Mr. Sidney Jones, Assistant Surgeon at St. Thomas's Hospital. Mr. Sidney Jones evacuated the pus and inserted a seton in the wound. The shoulder was painted with iodine and covered with gutta-percha, according to the patient's account. After two days the shoulder became very bad, and patient returned to St. Thomas's Hospital, where he was admitted under Mr. Simon. After one week, when he had been prepared for operation, the Hospital was closed, and the patient was discharged unoperated upon. The shoulder was then poulticed until it finally closed up.

In 1863 the "arm fell to the side" owing to the extensive disease of the bones about the right shoulder-joint. The patient went to University College Hospital, where Sir John Erichsen excised the shoulder-joint, but told the patient "he would never be able to get his hand to his head."

In January and July, 1885, some sinuses above the right axilla (? shoulder) were treated by Professor A. E. Barker and Sir Victor Horsley.

At the present time there are seen to be numerous depressed scars of healed sinuses in front of and behind the right shoulder-joint. The joint was evidently opened by means of an external (deltoid) flap. The right upper arm is notably shortened compared with the left. The right hand can be readily brought round to touch the occiput.

Case of Osteitis Deformans.

By BERNARD MYERS, M.D.

F. S., MALE, aged 57. The patient came to the Western General Dispensary about a year ago for advice with regard to severe pains in the back and legs. It appears that he has suffered from pains in various bones and joints for five years. The affected bones include the vertebræ,

both femora, especially the left, both tibia and fibula, the right radius and ulna and the skull.

The walk of the patient is suggestive of osteitis deformans. He has lost about 4 or 5 in. in height since his pains began. The head is bent forwards, evidently on account of the usual dorso-cervical kyphosis of this complaint. There is very distinct thickening of the left femur, which also shows an outward and a forward curve. There is some thickening of left tibia and, perhaps, in the right radius and ulna. The clavicles seem to be a little enlarged also. The peculiar feature of the case is the apparent want of increase in thickness of the cranial bones. He can wear the same hard hats now as formerly. He has arterio-sclerosis rather well marked. Pains in the præcordial region trouble him occasionally. The appetite is good, the bowels open daily, the speech "stuttery" at times, the memory fair, and he sleeps well. There is no similar case in his family. The urine is normal. The calcium content of his blood was estimated upon two occasions and each time it was less than normal. The Wassermann test was negative.

The diagnosis of osteitis deformans is backed up by the X-ray photographs, the only difficulty being his skull and a rather prominent lower jaw. The latter suggested the possibility of the co-existence of Paget's disease with acromegaly, but an X-ray picture showed a normal sella turcica and nothing abnormal in the inferior maxilla.

With regard to treatment, he has taken quinine, iodide of potassium, and nux vomica with no noticeable benefit. For the pain various liniments have been tried and, perhaps, have been of some use, but his greatest relief from pain has been obtained from salicylate of sodium, which he is still taking in conjunction with tonics.

Case of Osteitis Deformans ; Operation for Fractured Femur.

By GORDON TAYLOR, M.S.

E. E., AGED 56, was admitted into the Middlesex Hospital on April 29, 1913, for a fracture of the middle of the shaft of the right femur. Attempts to secure proper apposition of the fragments by means of splints and extension were not successful, and on May 16 an operation was performed by my colleague, Mr. Kellock, and the fragments were fixed by means of a Lane's plate. Recovery was

uneventful, and he was transferred from the wards to the out-patient department under my care on July 16. Before leaving the wards he was discovered to be suffering from osteitis deformans. Both femur and tibiæ are bowed; the upper part of the spine is fixed in its bowed position; the clavicles are enlarged and the bones of the upper extremity are also slightly curved. There appears to have been no change in the dimensions of the cranium. The condition does not appear to have influenced the union of the fracture in any way.

DISCUSSION.

Dr. F. PARKES WEBER said that he remembered the case of a middle-aged man many years ago with osteitis deformans, accompanied by much intractable pain. That patient accidentally fractured the shaft of his much affected femur, and as a result (for a time) the pain in the bone was greatly relieved. Bony union of the fracture took place in the ordinary way as in healthy individuals. Cutting into the bone might perhaps be of use as a last resource to relieve the pain in cases of osteitis deformans. Dr. Weber had no doubt that the calcareous or bony mass, mentioned by Mr. Kellock as having formed in the muscles near the site of a fracture, was analogous to the bone which developed in cases of *localized traumatic myositis ossificans*, and it was almost certainly due to injury of the periosteum and displacement of bone-forming cells (osteoblasts) into the neighbouring fibrous and muscular tissues. It was a curious fact that, in some cases of osteitis deformans, there was much pain, whilst in others (as in the case Dr. Weber brought before the Clinical Section on February 9, 1912) there was no pain at all. Similarly, in some cases of chronic hypertrophic syphilitic osteo-periostitis (which, as a late manifestation of inherited syphilis, might simulate Paget's osteitis deformans) there was much associated pain, but in others none or scarcely any.¹

Mr. J. E. H. ROBERTS said that, last year, he saw a man with advanced osteitis deformans who had fractured his femur some time before. Union had taken place in the usual time. This case led him to look up the literature on the subject. Although text-books made statements rather dogmatically—some that union occurred normally and others that union was delayed—he could only find four actual cases reported in the literature up to 1906. In three of the cases fractures occurred after very slight violence, and union seems to have taken place in the usual way: Case I,² a man fractured a rib in turning in bed; Case II,³ a woman fractured both bones of the leg by knocking against a stool

¹ So also the lime-salts in the bones might be decreased or (probably in quiescent stages with osteo-sclerosis) increased.

² Mackenzie, H. W. G., *Trans. Clin. Soc. Lond.*, 1896, xxix, p. 245.

³ Mackenzie, Stephen, *Trans. Clin. Soc. Lond.*, 1885, xviii, p. 331.

without falling ; Case III,¹ a man sustained repeated fractures, including sacrum, pubis, and femur, and finally an attendant caused a fracture of the fibula while putting on an elastic stocking. In the fourth case,² a man fractured the neck of the humerus. As no union had occurred in six weeks an attempt to wire was made. This was unsatisfactory, owing to the softened state of the bone, and a fracture above the condyles was caused during the operation. There were probably other cases reported in more recent literature. Nichols, of Boston, indeed, reports one in Keen's "Surgery." There are no details, but union took place in the ordinary time with only a small callus. With regard to Dr. Myers's case, he had seen it stated that extract of red bone-marrow had relieved the pain in several cases, though without influencing the cause of the disease.

Case of Lipoma Nasi.

By THOMAS H. KELLOCK, M.C.

THE patient is a man, aged about 77, who has been a licensed victualler. About twelve years ago he first noticed that the end of his



Case of lipoma nasi.

¹ Meunier, *Nouvelle Iconog. de la Salpêtrière*, 1894, vii, p. 17.

² Elting, *Bull. Johns Hopkins Hosp.*, Balt., 1901, xii, p. 345.

nose was getting larger, and it has steadily increased in size since, but he thinks the growth has been more rapid during the last six months or so. There is now a tumour almost the size of a fist attached by a pedicle to the lower part of the nose. It shows the usual depressions at the points where the sebaceous glands open; it will be seen that the alæ nasi are, independently, in a similar condition.

The case is of further interest in that, when aged about 15, he sustained a serious accident, fracturing the left thigh and both bones of the same leg below the knee. He was taken to Guy's Hospital immediately after the accident, where an amputation was performed. The operation was done without any anæsthetic, and took, according to the patient's account, about a quarter of an hour, and subsequently the fractured thigh was set. From his own account the man seems to have been an interested spectator of the operation, and remarked to the surgeon that "the bone was uncommonly tough." The operation appears to have been performed by the circular method at "the seat of election," but the end of the fibula projects beyond that of the tibia.

Congenital Heart Disease; probably Pulmonary Stenosis with Incomplete Ventricular Septum.

By W. ESSEX WYNTER, M.D.

H. S., MALE, aged 26, suffered from pains in both elbows and knees at the end of September, 1913, this being the only occasion on which he could recall anything of the nature of a rheumatic attack. On account of the loud cardiac murmur he was kept in bed for several weeks and finally sent to hospital. The apex beat is just within the nipple line, and pulsation, with dullness on percussion, extends 1 in. to the right of the sternum. A loud systolic murmur can be heard over the præcordia, the point of maximum intensity being in the fourth space near the sternum. It is so loud that it can be heard for some distance radiating from this point, but is best conducted towards the left clavicle in the course of the pulmonary artery. It is inaudible in the carotids and posteriorly. The second sounds are distinct but not increased, and there is no diastolic murmur. The pulse is normal in character, neither small nor collapsing, and regular. Blood-pressure, 170 mm. of mercury. There is no enlargement of the liver, no œdema, nor any cyanosis.

except during rare attacks of cardiac disturbance, and there is no clubbing of digits. The patient has always suffered from shortness of breath on exertion; was never able to play games, and cannot perform any arduous work. Blood count: Red cells, 6,512,000; white cells, 6,400; hæmoglobin, 100 per cent.; index, 0·8. The X-ray screen discloses enlargement of the right ventricle and limited bulging of the conus arteriosus to the left.

Patent Ductus Arteriosus.

By W. ESSEX WYNTER, M.D.

A. H., FEMALE, aged 35, was admitted on December 19, 1913, for hysterectomy on account of uterine fibroids. The patient had been admitted twice during the past two years, once at St. Mary's Hospital and once at St. Bartholomew's Hospital; at the former, operation was thought inadmissible on account of the heart condition. The same doubt arose at the Middlesex Hospital, but the view that the murmur was due to a patent ductus having been arrived at, no objection remained either to the operation or anæsthetic. Total hysterectomy was performed on December 20 by Sir John Bland-Sutton. No trouble was experienced with the anæsthetic, the patient bearing the operation well and making a very rapid recovery.

The patient had scarlet fever at the age of 7. "Cardiac weakness" had been attributed for five years since the third and youngest child was born. With the dysmenorrhœa which occurred during that time there were often associated pseudo-anginal attacks. A loud systolic murmur is heard in the third left intercostal space, accompanied by a thrill. There are no appreciable cardiac changes or enlargement. The temperature is normal and there is no dyspnœa even on exertion. She played hockey and cricket in girlhood, and activity has not been restricted by the heart condition. No secondary changes, such as enlarged liver or œdema, have occurred. By the X-ray screen the heart appears normal in size and position, but there is bulging of the pulmonary artery above the heart shadow (second and third ribs).

DISCUSSION.

Dr. CLIVE RIVIERE suggested that the second case (patent ductus arteriosus) might be one of slight pulmonary stenosis. The murmur was purely systolic in time and appeared to be conducted outwards; the fact that no symptoms or cyanosis were present only proved that the lesion was a slight one. He thought there were changes in the thumb-nails suggestive of slight clubbing.

Dr. WYNTER, in reply, said the diagnosis of the exact condition in these cases was necessarily somewhat conjectural. He based the diagnosis of communicating ventricles to some extent on the position of maximum intensity of the systolic murmur low down in the fourth space below the site of the valves. It was scarcely possible to discriminate a pulmonary systolic murmur independently, but apart from this deformity there would be no ground for imperfection of the septum. In the second case a patent ductus was diagnosed on account of the maximum intensity of the murmur and thrill being higher up, it was also audible along the spine. A diastolic murmur was not essential. The definite enlargement of the conus arteriosus well above the heart shadow was also an important indication. The chief points, however, in the diagnosis of congenital defect were the relative lack of symptoms or physical signs in association with a very loud murmur. There was little to be said about the treatment of the lesion itself, but it was important not to allow a mistaken notion of the cardiac condition to interfere with the freedom of the patient in other directions, as had been illustrated in these two instances.

Syringomyelia with Features of Acromegaly.

By W. ESSEX WYNTER, M.D.

T. S., MALE, aged 44, has suffered eleven years from the present condition, consisting of tense œdema of hands and wrist with progressive enlargement of head and lower jaw and attacks of dyspnœa. In 1906 amputation of the left forearm was performed in Buenos Ayres, as the tense skin ruptured and sloughed. The remaining hand is almost globular owing to the swelling. There is some power of movement in the wrist, but little or none in the hand and fingers when the swelling is great. Sensation is lost as far as the elbow. There are some small superficial sloughs on the back of the hand. Appreciation of touch, pain and temperature are lost here and over the greater part of chest and back. The head appears to be increasing in size, as larger-sized hats are required, and the extension of the lower jaw with

loss of teeth interferes with mastication. Headaches occur from time to time, accompanied by nausea and also attacks of hæmaturia, when clots appear in the urine for three days at a time. Within a few months of the commencement of the illness notable enlargement of glands in the axillæ and above the left clavicle occurred and have recurred on four



Photograph showing enlargement of head and elongation of jaw, with shading indicating area anæsthetic to pain, temperature and touch. There is a blister on the first finger due to unfelt scald by hot water.

occasions, the swelling attaining the size of a golf ball and lasting a week. Urine, specific gravity 1026, deep yellow, no albumin or sugar, no deposit.

The patient had enteric fever and empyema at the age of 8. The thoracic and abdominal organs appear normal and there is no abnormality about the trunk or lower extremities. Mother and five brothers

and sisters are living and well. X-ray screen examination shows some light shadows in the region of the bronchial glands on each side of the vertebral column, but no massive enlargement or growth. The sella turcica does not appear enlarged, but there is some increase in size and density of hand bones. The patient has lost $\frac{1}{4}$ in. in stature.

Dr. F. PARKES WEBER said that the man's right hand was absolutely typical of a certain clinical type of syringomyelia. It was quite insensitive to pain and was deformed by an extreme degree of chronic hard swelling of the soft parts with apparently some shrinking of the terminal segments of the fingers. Charcot had spoken of similar cases as examples of "syringomyelia of the Morvan type," but in Dr. Wynter's patient there had been no painless whitlows, such as were characteristic of the cases originally grouped under the heading "Morvan's disease." Doubtless the condition of the left upper extremity was likewise typical of syringomyelia at the time when it was amputated. A remarkable feature of this case was the alteration in the lower jaw, which suggested an admixture of acromegaly. The presence of syringomyelia was, however, certain, and one ought, therefore, in the absence of skiagraphic confirmation, to hesitate in suggesting the presence of acromegaly as well.

Hypertrophied and Dilated Urinary Bladder.

By C. R. Box, M.D.

MALE, aged 7. Mother had six children (two died) ; one miscarriage (first). Abdomen noticed to be an odd shape three weeks after birth. About this time the boy was circumcised. Now the urinary bladder is greatly hypertrophied and dilated ; it reaches almost to the navel. He does not empty it completely and has some difficulty in starting micturition ; nocturnal enuresis is present. There is polyuria (40 oz. or more in twenty-four hours). The urine varies in specific gravity from 1004 to 1030 ; it contains a trace of albumin, but no casts. The child is very thirsty and shows some signs of rickets. There is marked infantilism. The pituitary fossa is not enlarged. No evidence of any lesion of nervous system. The kidneys cannot be felt.

Points of special interest for which the case is exhibited : The great hypertrophy of bladder without obvious obstruction of urethra. Skiagrams show no stone, a catheter passes easily, and *per rectum* only the large bladder can be felt.

Case for Diagnosis—Fusiform Swelling of Shaft of Left Humerus, enclosing Central Cavity.

By PAUL BERNARD ROTH, F.R.C.S.

Boy, aged 9, complaining of pain in left upper arm. Eighteen months ago he fell down and hurt his left arm. He apparently recovered from this, but two months later, as the arm had begun to pain him, he was brought to hospital and examined, but nothing was



Fusiform swelling of shaft of left humerus enclosing central cavity.

discovered amiss. On January 2, 1914, he came under the care of Mr. T. H. Openshaw, when a fusiform swelling of the shaft of the left humerus was observed. This swelling is of bony consistence, is tender on firm pressure, and the muscles surrounding it are slightly wasted. The movements of the limb are not affected. A skiagram shows a spindle-shaped enlargement of the shaft of the humerus, involving its middle third. This enlargement consists of a central cavity, the size of a hazel-nut, surrounded by thickened and sclerosed compact bone.

It is suggested that after the original injury some necrosis of the bone took place; this formed an abscess, and ever since has produced irritation, which has caused the thickening and sclerosis.

I am indebted to Mr. T. H. Openshaw for kind permission to show this case.

Mr. ROTH said that in the course of the evening seven different diagnoses had been made of this case, and it had even been suggested to him that the skiagraphic appearances were due to an artefact. He proposed to have another skiagram taken and would let the members of the Section know what was found at operation.

Addendum.—The second skiagram showed the central cavity even more clearly than the first one, and is reproduced here. Mr. Openshaw operated on February 5 and found that the condition was due to a central abscess.

Clinical Section.

February 13, 1914.

Mr. CHARTERS J. SYMONDS, President of the Section, in the Chair.

CASES IN WHICH SPLENECTOMY HAS BEEN PERFORMED, OR IS CONTEMPLATED, FOR DISEASE.

Splenic Anæmia in a Father and Three Children.

By T. R. WHIPHAM, M.D.

Case I.—The father, aged 39, a railway fitter, has had no illness since childhood until three years ago, when, simultaneously with the three children shown, he was suddenly attacked with high fever of a remittent character, the nature of which was not fully determined. All four recovered in a few days, but were noticed to be exceedingly anæmic. Since that time the patient states that he has "never felt the same," though he has not complained of any particular symptoms. In October, 1913, he had an attack of influenza, when Dr. H. F. Staunton, who sent him to me, found that he had an enlarged spleen. Syphilis is denied, and the Wassermann reaction is negative. The patient is somewhat anæmic and has lost strength and weight recently. The spleen is considerably enlarged, and reaches nearly to the middle line and to a little below the level of the umbilicus. The liver is of normal size, and there is no increase of the lymphatic glands.

BLOOD COUNT.

	November 17		December 5		January 15
Red cells ...	3,352,000	...	3,342,000	...	3,520,000 per c.mm.
White cells ...	12,600	...	12,500	...	8,800 "
Hæmoglobin ...	—	...	—	...	75·0 per cent.
Polymorphonuclears	75·0	...	71·4	...	46·0 "
Lymphocytes (small)	12·0	...	14·3	...	42·0 "
" (large)	1·2	...	2·2	...	3·0 "
Eosinophiles ...	7·0	...	6·0	...	5·0 "
Myelocytes ...	5·0	...	3·3	...	1·0 "
Mast cells ...	0·1	...	2·2	...	3·0 "
			No normoblasts.		A few normoblasts.
			No poikilocytes.		Many megalocytes, microcytes and poikilocytes.

The man has recently passed segments of a tapeworm and probably still harbours the head.

Case II.—Son of the above, aged 15, an office-boy. Patient had chicken-pox, measles, and whooping-cough at the age of 6, and diphtheria when aged 9. With the exception of the indeterminate illness three years ago he has not been ill since, though he has been noticed to be pale. He has never suffered from worms. The boy shows a moderate grade of anæmia; his spleen is firm and considerably increased in size, though it is not quite so large as that in Case I. The liver and lymphatic glands are not enlarged.

Case III.—Daughter, aged 13. She had chicken-pox, measles, and whooping-cough at the same time as her brother, and acute rheumatism four years ago, which left no cardiac lesion. Three years ago she had the illness already referred to. In December last she had a second attack of acute rheumatism, which was followed by pneumonia, and now has incompetence of the mitral valve. She has never had worms. The patient shows a marked degree of anæmia and is much paler than she was before her recent illness. The spleen is firm and enlarged to beyond the middle line and almost to the level of the umbilicus; it is now a little larger than it was two months ago. There is no enlargement of the liver or lymphatic glands.

BLOOD COUNT.

		December 5		February 4
Red cells	... ..	2,210,000	...	1,536,000 per c.mm.
White cells	... ..	9,500	...	13,600 „
Hæmoglobin	... ..	—	...	35.0 per cent.
Polymorphonuclears	... ..	68.0	...	64.5 „
Lymphocytes (small)	... ..	15.0	...	14.0 „
„ (large)	... ..	4.2	...	6.2 „
Eosinophiles	... ..	9.1	...	9.1 „
Myelocytes	... ..	2.0	...	3.0 „
Mast cells	... ..	2.0	...	2.0 „
		No normoblasts.		No normoblasts.
		No poikilocytes.		

Case IV.—Daughter, aged 9. Patient had chicken-pox and measles at the same time as the other children, and meningitis four years ago. She has also had two or three attacks of acute rheumatism and the heart shows evidence of a mitral lesion. Three years ago she had the

same febrile illness as her father and elder brother and sister. There is no history of worms. The child is distinctly anæmic and presents a moderate enlargement of the spleen, its size being about the same as that of Case II. Like the other cases, she shows no hepatic or lymphatic hypertrophy.

BLOOD COUNT.

		December 5		February 4
Red cells	... ..	2,320,000	...	2,024,000 per c.mm.
White cells	... ..	8,500	...	10,800 "
Hæmoglobin	.. ..	—	..	25.0 per cent.
Polymorphonuclears	... ..	73.5	...	66.0 "
Lymphocytes (small)	... ..	14.0	..	14.0 "
,, large)	... ..	6.0	...	9.0 "
Eosinophiles	... ..	6.0	...	8.0 "
Myelocytes	.. ..	—	...	1.0 "
Mast cells	... ..	0.5	...	1.0 "
		No normoblasts.		No normoblasts.
		No poikilocytes.		

In addition to the patients shown the family consists of the mother and three other children; two girls, aged 11 and 6 respectively, and a boy, aged 3, all of whom are healthy. None of these suffered from the febrile illness three years ago.

Dr. WHIPHAM added that splenic anæmia was said to occur in families, but he thought that it was uncommon for the disease to exist in two successive generations. The condition of all the patients was discovered by accident. In none had the symptoms apparently been sufficient to call for medical advice, and it was not until the father's attack of influenza in October, when a routine examination revealed the presence of an enlarged spleen, that anything seriously wrong with him was known. While his history was being taken the man casually let fall the remark that three of his children had had the same febrile illness as himself three years ago. This led to an examination of them, when they were all found to be similarly affected. The first blood counts in these cases were very similar, and the corresponding differential counts were almost identical. In the case of the father, however, the last differential count showed a distinct change in the leucocytes, the small lymphocytes having increased considerably in number, while the polymorphonuclears had correspondingly diminished. At the same time, in spite of the fact that they were slightly more numerous, the reds showed considerable variation in size and shape, and a few nucleated cells were present, features which had not been observed previously. As regards the girls, the last counts showed a diminution in the number of red cells, especially in the case of the elder; the white cells were increased, but the differential count remained practically the same. Another feature of the blood in these cases was the rather high percentage of

eosinophiles. In the father this might be explained by the presence of a tape-worm, but in the children there was no history of any parasite. Dr. Whipham asked whether any or all of these cases were suitable for operation. The boy was at work, but the blood in the other three patients seemed to have deteriorated during the short time that they had been under observation.

Case of Splenic Anæmia treated by Splenectomy.

By PERCY SARGENT, F.R.C.S.

H. A., FEMALE, aged 10, under the care of Dr. G. D. Barton. Comparatively well until November, 1912, when the abdomen was noticed to be enlarging. In November she was found to have ascites and slight pyrexia. Abdomen opened on the supposition that the case was one of tuberculous peritonitis. Much clear fluid escaped; nothing abnormal felt. A fortnight later edge of spleen felt; no fluid detected. From this time onward spleen rapidly enlarged and by December 31 could be felt below umbilicus.

Blood count: Erythrocytes, 4,300,000; hæmoglobin, 40 per cent.; colour index, 0·5; moderate poikilocytosis; fair number of normoblasts; white cells, 2,000; polynuclear neutrophils, 63 per cent.; small lymphocytes, 33 per cent.; large lymphocytes, 3 per cent.

On January 12, 1913, the spleen was removed by Mr. Sargent through a paramedian incision. It was extremely friable, and after removal weighed 1 lb. There were no inflammatory adhesions. Hæmorrhage was not excessive. Although the main vessels were tied at an early stage several large veins at the upper part gave rise to trouble and necessitated the leaving on of three pairs of artery forceps. The child made an uninterrupted recovery. Six weeks later a severe hæmatemesis occurred and she was admitted to St. Thomas's Hospital. She was very pale; edge of liver palpable; pulse averaged 100; blowing apical systolic murmur; urine normal.

Blood count: Erythrocytes, 2,936,250; hæmoglobin, 30 per cent.; colour index, 0·5; ghosts, microcytes, and macrocytes present; very large number of normoblasts; white cells, 29,260; polynuclear neutrophils, 55·25 per cent.; small lymphocytes, 40·25 per cent.

For the next few weeks she had irregular pyrexia and a varying amount of diarrhœa. Treated with liquor arsenicalis.

Blood count when discharged: Erythrocytes, 3,028,125; hæmoglobin, 35 per cent.; colour index, 0·6; very few normoblasts; white cells, 9,100; polynuclear neutrophiles, 59·75 per cent.; small lymphocytes, 18·25 per cent.; large lymphocytes, 18·25 per cent.

Mr. ROUQUETTE said there was now neither enlargement of the liver nor ascites. The last blood count, a few days ago, showed a normal number of reds, no normoblasts, and no evidence of poikilocytosis. White cells: polynuclear neutrophiles, 35 per cent.; small lymphocytes, 58·5 per cent.; large lymphocytes, 1·5 per cent.

Case of Splenic Anæmia treated by Splenectomy.

By HERBERT FRENCH, M.D., and PHILIP TURNER, M.S.

B. P., MALE, then aged 5, was admitted to Guy's Hospital on March 31, 1912, in a very weak, pale, drowsy condition; he was very anæmic and, at the same time, suffering from bronchitis. On examination, the spleen was found to be much enlarged, reaching across to the middle line and down to the iliac crest; the liver was moderately enlarged, smooth, and soft. Several blood counts were made, the following figures being about the average: White corpuscles, 21,000; red corpuscles, 1,900,000; hæmoglobin, 20 per cent. The diagnosis made was pseudo-leukæmia infantum of the von Jaksch's type. The Wassermann reaction was positive on several occasions, and the patient's sister is now affected by a precisely similar malady. Previous to his admission to Guy's Hospital he had repeatedly been an in-patient in various hospitals, where he had received treatment by iron, arsenic, mercury, iodide of potassium, salvarsan injections, and the use of the X-rays locally over the spleen, but all without any marked benefit. From 9 months to 5 years of age the patient had been a yellow, anæmic, frail little boy, unable to be long out of bed; his general appearance was that of a patient in an advanced stage of pernicious anæmia. As all other treatment had failed to bring about improvement in the condition, it was finally decided, on September 26, 1912, to excise the spleen. This organ, on removal, weighed 18 oz., and measured 7 in. in length and 5 in. in width. An immediate progressive and remarkable change for the better took place, and in two months' time the boy looked perfectly normal. Since this operation he has survived both

scarlet fever and measles, and now is able to go to school. Apparently he has been quite cured by the splenectomy, has 85 per cent. of hæmoglobin, and is having no medicines at all.

Dr. HERBERT FRENCH said he had the privilege of showing also the younger sister of the boy, now aged 7 months, presenting anæmia and a big spleen similar to that of the boy at 5. He was not sure whether the majority of members present would agree with the diagnosis of "splenic anæmia" in either child. There was anæmia with a big spleen, due to congenital syphilis. Although many might exclude the syphilitic cases from the group "splenic anæmia," he gave them that name. Whatever the name given, however, the immediate and remarkable cure that followed splenectomy, when everything else had failed, indicated the value of this treatment in similar congenital syphilitic cases with big spleens and severe anæmia. One could scarcely form an idea how ill the boy had been unless one had seen him at the time. He lay in bed, perfectly helpless; now he looked a rosy-cheeked, normal schoolboy. There could be no doubt that splenectomy had cured him.

Case of Splenic Anæmia treated by Splenectomy.

By GEOFFREY HOFFMANN, M.B.

(For H. P. HAWKINS, M.D.)

A. W., GIRL, aged 12. This patient was shown to the Section in November, 1911, before the spleen was removed. Up to that time the history was as follows: At the age of 4 she suddenly vomited half a pint of blood, and when aged 6 she had a second hæmatemesis of one pint. Early in 1910, at the age of 8, she began to have frequent attacks of pain in the stomach and "around the heart." Crops of small purpuric spots appeared on the chest, and she is said to have bruised easily. Epistaxis occurred on one occasion.

She was admitted into St. Thomas's Hospital in April, 1910, when melæna was noticed on several successive days. The spleen projected $2\frac{1}{2}$ in. below the costal margin, and was indurated. Red cells were 2,425,000; colour index, 0·7; leucocytes were 3,700. Coagulation time was two minutes five seconds. Some improvement took place after a month of arsenic. Henoch's purpura was diagnosed at this time.

She remained fairly well, though always pale, until July 27, 1911, when she suddenly vomited a pint of blood. This was repeated twice

during the next few hours, and melæna was seen on nine successive days. The spleen was enlarged and firm as before, and moved freely with respiration. Red cells were 2,200,000; colour index, 0·5; leucocytes, 2,980, with no change in the relative proportions. The condition of the blood slowly improved under arsenic, and in November, 1911, the red cells numbered 4,328,000 and the colour index was 0·8. The liver was just palpable, though not hard. Jaundice had never occurred. She had another large hæmatemesis on December 18, 1911.

The spleen was removed by Mr. Makins on January 31, 1912. There was little shock from the operation, and the wound healed by first intention. Just before operation the red cells were 4,400,000, hæmoglobin 90 per cent., and leucocytes 3,060. Three days later, red cells were 3,620,000; colour index, 0·8; leucocytes, 43,480; 85 per cent. were polymorphonuclear cells and 4 per cent. small lymphocytes. The spleen showed perisplenitis and cirrhosis. Cultures were sterile on all media.

On February 9 red cells were 3,540,000; colour index, 0·8; and leucocytes, 12,740; 55 per cent. polymorphonuclears; eosinophiles, 4·6 per cent.; small lymphocytes, 18·4 per cent.; large lymphocytes, 5·6 per cent.; large hyaline cells, 15 per cent.

In December, 1912, the patient was readmitted for tonsillectomy, and the blood examination then showed: Red cells, 6,100,000; hæmoglobin, 100 per cent.; leucocytes, 9,520; small lymphocytes, 47 per cent.; polymorphonuclears, 32 per cent.; eosinophiles, 11·5 per cent.; large lymphocytes, 5·5 per cent.; large hyaline, 2·5 per cent.

In May, 1913, red cells were 4,500,000; hæmoglobin, 90 per cent.; leucocytes, 13,420. The relative proportions of the latter were similar to those in the last blood examination.

Since the operation she has been in good health and there has not been any more bleeding. A recent blood count shows 5,475,000 red cells; hæmoglobin, 100 per cent.

DISCUSSION.

Sir JOHN BLAND-SUTTON said the results of removal of the spleen in cases of splenic anæmia in children had been so good, both immediate and remote, that when he looked over the list of cases shown by Dr. Whipham it occurred to him a good thing to remove the spleen of the boy aged 15. He had to get his living, and would be seriously handicapped by a big spleen. If it were done by a surgeon accustomed to splenectomy, the result would be so excellent that the rest of the family would willingly submit to operation, excluding the father.

Dr. GORDON WARD suggested that Dr. Whipham's cases could not, for several reasons, be regarded as examples of familial splenic anæmia. In the first place, there was no such thing as familial splenic anæmia with the exception of the Gaucher type, and with that these cases could not be confounded. In all cases reported as examples of splenic anæmia in more than one member of a family, there were facts noted which were of a nature to throw grave doubts on the diagnosis. That was so in these cases of Dr. Whipham. Two of these cases had a yellow colour. Now in splenic anæmia the yellow colour only appeared when cirrhosis had supervened, but in acholuric or hæmolytic jaundice the yellow colour was present from the beginning. It was true, of course, that in some cases it did not appear at all, but when it did it was not a late sign, as in splenic anæmia. Again, splenic anæmia was a disease in which the blood-forming organs appeared to be in a condition of aplasia, nor were there any signs of hæmolysis in the urine or elsewhere. In cholæmia there were signs of hæmolysis, and the blood showed active reaction to the hæmolysis. This reaction was present in Dr. Whipham's cases, and the hæmolysis was shown by the yellow colour. In none of these cases was there a leucopenia, as was the rule in splenic anæmia. In two cases there was a colour index above unity; this, again, was very unlike anything seen in splenic anæmia. In the case of the father there were $3\frac{1}{2}$ million red cells, and yet there were normoblasts present. He questioned very much whether such a blood condition had ever been recorded in splenic anæmia, except perhaps after a hæmorrhage. It was, however, the rule in cholæmia. Had the father and the son been yellow no question of the cases would have arisen in all probability, and he appealed to Dr. Whipham, if the debate supported his (the speaker's) view of the nature of these cases, to alter the name under which they would appear in the *Proceedings*. He would like, in conclusion, to express his personal opinion that the use of the term "splenic anæmia," without any qualifying phrase—e.g., "of the Gaucher type," "of infancy"—should be most strictly reserved for cases which were idiopathic, accompanied by hæmorrhages from the stomach, and terminated in cirrhosis of the liver—i.e., in Banti's disease. If a case were suspected to be syphilitic, it should be referred to as "syphilitic splenomegaly," while if thrombosis of splenic vessels could at all reasonably be implicated as a causal factor, the case should be called "thrombosis with splenomegaly." If cases were recorded in the literature under some such system much confusion would be avoided.

Dr. F. PARKES WEBER agreed with Dr. Gordon Ward's remarks, but it was largely, he thought, a question of terminology. He would go so far as to say that when one got a family series of enlarged spleens, in which adult members of the family were affected as well as children, and in which there was decided anæmia, those were instances of what he (Dr. Weber) had termed "splenomegalic anæmia,"¹ which, even though there might be no

¹ F. P. Weber and G. Dorner, *Lancet*, 1910, i, p. 227.

jaundice clinically apparent, was probably of the same nature as chronic acholuric (hæmolytic) jaundice. In cases such as the present ones, the onus of proof lay on the exhibitor to show that they were not instances of that kind of "splenomegalic" (hæmolytic) anæmia. No member of Dr. Whipham's family group showed any leucopenia, and that alone suggested that Dr. Whipham's cases were not instances of true splenic anæmia. Dr. Weber believed that one practically never saw typical splenic anæmia over a long period without there being leucopenia present. But, on the other hand, there were many cases of chronic enlargement of the spleen, which were not splenic anæmia, but which showed leucopenia. With regard to Mr. Sargent's case, the patient was not very ill when the spleen was removed, and so one did not know exactly how beneficial that removal was. Still, as the operation had done no harm, the little girl was now to be congratulated on having lost the enlarged organ, possibly a site of quiescent disease, which might have been liable at some period to become again active. In reference to Dr. French's case, it belonged to a class that had been very much under discussion at one time or other—namely, children with a large spleen and a certain amount of cachexia, who showed evidence of congenital syphilis. It was an unfortunate fact that antisymphilitic treatment did not do these cases good in every instance; hence one was driven to the conclusion that the splenic enlargement in these cases was not always itself actually syphilitic, though it arose and flourished on a syphilitic basis. Dr. Robert Hutchison, who had had several such cases under his care, had declared at a meeting of the Section for the Study of Disease in Children, that if he had similar cases again, with enlarged spleen on a syphilitic basis, and a cachexia not yielding to treatment, he would have the spleen removed. That was what Dr. French had had carried out in his case, and he congratulated him on the result.

Dr. BOX desired to refer particularly to Dr. French's patient, because that boy had been under his own care at St. Thomas's Hospital ever since he was aged 9 months. He had the records of many blood counts which were in the case, and they conformed with von Jaksch's anæmia. The boy made no progress under the various treatments adopted. He then went to Guy's Hospital, where his spleen was excised. He had seen the boy since, and knew he was now cured. He had also heard that a younger sister had splenic enlargement. Now and then the lad had had a cholæmic tinge, and he asked whether at Guy's Hospital any experiments had been made concerning the fragility of his corpuscles, because these cases of splenic anæmia were inextricably mixed up. In the text-books the splenic anæmia of adults was rightly separated from the splenic anemia of children on the strength of the blood count, and acholuric icterus formed yet another disease. He had now under care a younger child, with the same type of blood as Dr. French's patient, but he had increased fragility of corpuscles, though not so great as that met with in some cases of acholuric icterus. Dr. Box wondered whether increased fragility really constituted a disease *sui generis*, or whether it might be developed

during the course of the disease in cases of infantile splenic anæmia of the von Jaksch type. Dr. Hawkins had now under his care at St. Thomas's Hospital a patient with acholuric icterus, in whom the fragility was great, so that if a saline infusion were done the blood would be disintegrated. In September, 1912, he (Dr. Box) induced Mr. Corner to excise a spleen for acholuric icterus; he was not then aware it had been wilfully done before, though he was not so certain on that point now. His experiment ended in disaster, since the patient died three weeks afterwards from an abscess in the stump of the spleen and acute nephritis. Still, the blood condition was greatly improved by the splenectomy, though the fragility of the corpuscles was not altered by the operation. There was now ground for saying that similar treatment in the same kind of case would certainly do good. Dr. French's case showed that the operation also did good in cases which came under the heading of von Jaksch's anæmia (i.e., splenic anæmia of infants). Dr. Weber was rightly guarded in his remarks as to operative treatment in the syphilitic form of infantile splenic anæmia. He (the speaker) had under care now a child with the syphilitic form in whom mercurial inunction had brought about a marvellous improvement, with great alteration in the blood count; the spleen had also diminished in size. Before advocating splenectomy in such cases antisiphilitic remedies should be tried, and to the full extent. There seemed to be some running together of all these forms of "splenic anæmia." It looked as if von Jaksch's anæmia could show fragility of corpuscles in certain cases, and further, some Continental observers suspected that some of the cases of splenic anæmia of infancy might turn into what was known as the splenic anæmia of adults—i.e., anæmia characterized by leucopenia.

Splenectomy for Acholuric Jaundice.

By W. ESSEX WYNTER, M.D., and Sir JOHN BLAND-SUTTON,
F.R.C.S.

M. W., AGED 23. This patient has already been twice before the Section, on November 8, 1912, and January 10, 1913,¹ showing the condition before and after operation, and the notes appear in the proceedings of those meetings. There had been no material change since, beyond an improvement in the state of the blood and a steady maintenance of good health.

Briefly, the anæmia and jaundice had been present from birth in varying degree. The only other member of this family was a half-

¹ *Proceedings*, 1913, vi, pp. 33, 80.

brother, now aged 8 and quite healthy. Wassermann's reaction negative. The spleen was enlarged and hard (3 lb.). The red cells and hæmoglobin were reduced nearly 50 per cent; nucleated reds, 78 per cubic millimetre; white cells, 13,000. Bilirubin was present in the serum and urobilinogen only in the urine. Fragility of corpuscles was represented by laking in saline solution 0·55 per cent. as against 0·45 per cent. control.

Splenectomy was performed on December 11, 1912, with immediate relief of symptoms, the jaundice disappearing within twelve hours.

A month afterwards the red cells had increased to 3,365,000 and the white cells diminished to 7,000. Corpuscles laked at 0·45 per cent. saline solution against 0·37 control. There was no urobilinogen or excess of urobilin in the urine.

DISCUSSION.

Dr. ESSEX WYNTER added that a blood count the previous day showed the red cells to be over five millions, and the hæmoglobin 110 per cent. Several of the splenectomy patients shown that evening exhibited the complexion of chronic mitral disease in consequence of the relative plethora. As a result of removal of the spleen in acholuric jaundice, it was usual to have an excess of blood for some months. It was now a year since the operation, and it took some months for the blood to subside to the normal. He suggested that the blood destruction due to the condition of the spleen was partly balanced by an over-production going on in other parts of the body, and that when the spleen was removed this over-production continued for a time and resulted in an excessive blood count. Another aspect of the matter was that it had been suggested by some physicians that, inasmuch as these patients had what was called tolerable health and survived a number of years, the operation was either not desirable or was inadmissible. He contended that mere duration of life was not the whole of what should be aimed at, but fullness of life. In this instance which Sir John Bland-Sutton and he were showing, a partial invalid had been converted into a practically normal person, maintaining herself and entering fully into the enjoyment of life.

Sir JOHN BLAND-SUTTON endorsed the remarks of Dr. Essex Wynter. He added that if it were a fact that the enlarged spleen associated with hæmolytic jaundice and anæmia was a later stage of the splenic anæmia of children, it would not only help us in deciding the appropriate treatment, but would tend to clear up much of the confusion in terms which hampered the clinical classification of enlarged spleens in adolescents.

Splenectomy for Congenital Acholuric Jaundice.

By HUGH THURSFIELD, M.D.

THE patient was aged 9 when he was first seen in the early part of 1902. He had always been of a yellowish colour, though the parents were unable to state whether the tint had been noticed actually at birth. He was admitted to the Hospital for Sick Children for anæmia and shortness of breath; his heart was considerably dilated and there was a harsh systolic murmur audible over the præcordia. The liver was palpable 1 in. below the costal margin and the hard smooth spleen reached to within 1 in. of the iliac crest. His erythrocytes were 1,460,000 per cubic millimetre and his hæmoglobin 30 per cent. The fæces contained plenty of bile pigment, while the urine, though of a dark colour, contained none. On several occasions a well-marked urobilin band was seen by the spectroscope. The cerebrospinal fluid did not contain bile, nor did the serum of the blood on the only occasion on which it was examined. A Wassermann test was negative.

The patient improved for a short time, but was readmitted in August, 1912, more anæmic and exhausted than before. His erythrocytes were now only 1,097,000 per cubic millimetre and his hæmoglobin had sunk to 20 per cent. The fragility of his corpuscles to solutions of saline was found to be considerably in excess of the normal; hæmolysis began in a 65 per cent. dilution.

Since the boy was obviously in danger and showed no signs of improvement, my colleague, Mr. Tyrrell Gray, removed the spleen. At the operation three spleniculi were seen and left untouched. The spleen was firm and hard, and when squeezed free of blood weighed 597 grm. After the operation there was the usual leucocytosis, but at the end of ten days this had disappeared and three weeks later the boy had entered on a steady course of improvement. The yellow tint disappeared and the erythrocyte count began to move upwards. The fragility of his erythrocytes, however, remained somewhat greater than the normal. As he lives some distance from London I did not see him again till nine months after the operation, when his erythrocytes were 5,186,000 per cubic millimetre and his hæmoglobin 95 per cent. The fragility was still a little greater than normal. At the present time, sixteen months

after the operation, he is in excellent health with no signs of the disease. His red blood corpuscles are 5,000,000 per cubic millimetre and his hæmoglobin 100 per cent. The standard of fragility is now absolutely normal.

DISCUSSION.

Dr. HUGH THURSFIELD said he wished to emphasize the importance, which was sufficiently obvious from the remarks that had been made, of trying to sort out the rubbish heap of "splenic anæmia." Speakers on this occasion had used the term in five or six different significations. He believed that there were means of distinguishing cases of acholuric jaundice from all other forms of enlargement of spleen—viz., the fragility of corpuscles. In England, America, France, Germany, wherever that examination had been made the fragility of the erythrocytes had been found definitely increased, at any rate in the congenital cases. It was further possible to say that in cases of enlarged spleen, of the "splenic anæmia" type, the fragility was either normal, or more frequently abnormal in the wrong direction—i.e., the corpuscles showed increased resistance. It was therefore most important that the fragility of the red corpuscles should be stated in every case reported as one of "splenic anæmia."

Sir BERTRAND DAWSON, K.C.V.O., agreed with Dr. Thursfield that probably these cases would need to be classified afresh. Among the cases of hæmolytic jaundice which had been published one could see close resemblances between some of them and pernicious anæmia. The anæmia, the size of the spleen, and even the fragility of the blood, were variable features. It was found possible to have hæmolytic jaundice without increased fragility of the blood. Cade had reported a case of a father who had an enlarged spleen and hæmolytic jaundice, but no increased fragility, with two children, who likewise had enlarged spleens and jaundice, but with increased fragility. He saw a case lately of typical hæmolytic jaundice, but without fragility. He did not think that the variability of fragility was very difficult to explain. The jaundice in these cases was due to over-production. There was a surfeit of bile in the liver due to the precursors of bile pigment being formed in excess by the spleen; this excess he believed must be due to an interaction between two factors—namely, the spleen and the fragile blood. The part played by each of these factors would vary in different cases. The spleen might be so active as even to be able to break down blood in excess which was not normally fragile. On the other hand, it was conceivable that blood might be so fragile that even the removal of the spleen would not prevent an excess of bile formation. He regarded the manufacture of the bile pigment as a special function of the spleen which was distinct from the action which broke down blood, and which if present in excess produced an anæmia. Another point of interest was that in many cases the fragility persisted after removal of the spleen. He had not

yet published a case which he was fortunate enough to have under observation, the case in which Sir Spencer Wells removed the spleen in 1887. He had a complete record of that case, and of the son of that patient. He examined the blood of the first-named patient a short time ago, and her blood was still fragile though she was cured of her hæmolytic jaundice. He suggested that there was a proneness on the part of these people who had this surfeit of bile in the liver to form gall-stones, and he did not doubt that they did have gall colic. They had often what were called "bilious attacks," with a rise of temperature, and sometimes pain, and during these phases they would be found to have bile in the urine. In the son of Sir Spencer Wells's patient there were definite attacks of tenderness over the gall-bladder, and that viscus was explored, when it was found to be packed with bile mud. In the case of the girl he was now showing, though she only showed a certain amount of dyspepsia, her gall-bladder was explored, and four gall-stones were found. Her spleen was subsequently removed. If one removed the spleen, and there was a gall-bladder packed with stones, recovery would not be completed by the splenectomy. It was better to get rid of the gall-stones first. If people had gall-stone colic and enlarged spleen, and after the former had been dealt with the jaundice persisted, it would be well to test the blood for increased fragility. It was not necessary for the spleen to be always very big. He thought it would turn out that in the young cases, whose splenic tissue reacted easily, large spleens would be the rule, but he did not think it was necessary for people who acquired hæmolytic jaundice late in life to have very big spleens, because their splenic tissue would react less readily. In response to Dr. Wynter's suggestion as to whether hæmolytic jaundice should be left alone, his opinion was that it should not. Not only did these people have a poor quality of life, but they were liable to gall-stones; and he believed, further, one could meet with cases which almost glided into the group of splenomegalic cirrheses, and he believed some of the hæmolytic jaundice cases would have a tendency to get that cirrhotic liver which one was accustomed to associate with so-called Banti's disease.

Dr. PARKES WEBER said that the question of the association of cholelithiasis with chronic acholuric jaundice (hæmolytic jaundice) had been discussed in France by Gilbert and others,¹ and several cases had been described. But the percentage of cases of chronic acholuric jaundice which had developed cholelithiasis was, he believed, not a large one. With regard to classification, Chauffard first succeeded in clinically separating out a group of jaundice cases characterized by excessive fragility of the erythrocytes towards hypotonic saline solutions; the presence of jaundice with bilirubin in the blood serum but none in the urine, but with excess of urobilin in the urine; the frequent presence in the blood of a few normoblasts, with great anisocytosis and polychromatophilia of the red cells. It then became possible for others to pick

¹ See, for instance, Chauffard "Choléolithiase pigmentaire dans un cas d'ictère congénital hémolytique," *Bull. et Mém., Soc. méd. des Hôp. de Par.*, 1912, xxxiv, p. 80.

out cases of anæmia without jaundice, but which nevertheless showed the blood characters of what was called chronic "hæmolytic jaundice," or "chronic acholuric jaundice with anæmia and splenomegaly." Dr. Weber had suggested that anæmia of that kind should be termed "splenomegalic anæmia," so as to distinguish it from splenic anæmia.¹ Then there also arose the question, was this excessive fragility of the erythrocytes an essential feature of chronic "hæmolytic jaundice" and (what Dr. Weber termed) "splenomegalic anæmia"? He thought it must be regarded as always present in typical cases, but there were atypical cases which did not show the same decided excessive fragility (of the red blood cells towards hypotonic saline solutions). It had been supposed that in the typical cases of chronic acholuric jaundice bilirubin without bile salts was circulating in the blood, and efforts should be made to find out whether (as he understood to have been suggested) the presence of bilirubin or urobilin in the blood without bile salts could produce excessive fragility of the erythrocytes towards hypotonic saline solutions. It had indeed to be remembered that all abnormalities in the circulating blood must affect the bone-marrow, that is to say, the source of the erythrocytes. It was interesting to compare what happened in ordinary cases of obstructive jaundice in which both bile salts and bilirubin were probably circulating in the blood. In those cases there was often increased resistance, instead of increased fragility, towards the hæmolytic action of hypotonic saline solutions. G. D. Whyte² had suggested that the presence of sodium taurocholate in the circulating blood tended to increase the resistance of the red cells towards hæmolysis. (Dr. Weber did not know what effect excess of cholesterin in the blood might have upon the fragility of the erythrocytes.)

Case of Kala-azar (Parasitic Splenomegaly) in an Adult from Malta.

By Fleet-Surgeon P. W. BASSETT-SMITH, C.B.

THE patient, a man, aged 29, while on the Mediterranean station was for some months in 1912 employed on the rifle range at Malta; it was noted that dogs frequented the camp, but children were rarely seen. In 1904 he had an attack of enteric, otherwise his previous health had been good. Subsequently to leaving Malta (July, 1912) he had several attacks of slight fever which were thought to be influenza. Ten months after leaving the rifle range he was admitted to the Royal Naval

¹ Weber and Dorner, *Lancet*, 1910, i, p. 227.

² *Lancet*, 1914, i, p. 383.

Hospital, Chatham, for boils and anæmia. He was seen to be very cachectic, both the spleen and liver being greatly enlarged; the blood-picture was that of splenic anæmia, and Leishman bodies were obtained by a spleen puncture. He was then transferred to Greenwich in April, 1913, where he has been under treatment ever since.

The noticable clinical characters are:—

(1) The anæmic appearance with darkening of the skin, especially where this has been irritated.



FIG. 1.

Case of kala-azar. Areas of cardiac, hepatic, and splenic dullness indicated.
The liver, later, became much more enlarged.

- (2) The general emaciation and large belly.
- (3) The greatly enlarged hard spleen and liver.
- (4) The cardiac irritability and marked dicrotic pulse with low blood-pressure—98 to 115.

The urine is normal, there has been no diarrhoea, epistaxis rarely, coagulability of blood normal, the blood has shown a constant diminution

of both red and white cells, generally about 3,000,000 reds and 3,000 whites, but these have been as low as 1,600. There is a relative increase in the mononuclear cells; no parasites have been found in the peripheral blood. I have punctured the liver four times, finding parasites on the first two occasions but not on the last. Since that time they have been found in small numbers from the spleen. These have been successfully grown on N.N.N. media as flagellate bodies.

Besides ordinary treatment he has had intramuscular injections of atoxyl every fourth day, commencing with 2 gr., now 5 gr.—68 injections and 290 gr. of the drug. He has also received every fourth day into the other buttock injections of a vaccine made from his own cultivated bodies obtained by a liver puncture (about 15 million for a dose). Constant counter-irritation has been applied to the splenic area, and yeast has been given to increase, if possible, the white cells.

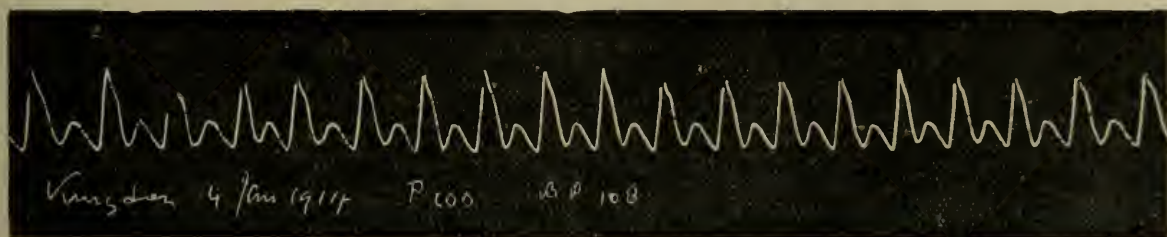


FIG. 2.

Pulse tracing showing marked dicrotic wave, which has been present throughout.

During the ten months' treatment he has apparently not lost ground and the spleen is slightly smaller, which is a hopeful sign. It is possible that the parasites may be gradually killed off by the atoxyl, but the mortality is about 96 per cent.

The chief points of interest are:—

(1) The age of the man, for the Mediterranean form of the disease is almost always found in children aged from 1 to 5 and also affects dogs, whereas the Indian form is most common in adults.

(2) The recovery of the parasite from both liver and spleen, which in small doses was non-pathogenic to rats, guinea-pigs and rabbits, but could be easily cultivated on N.N.N. media.

(3) The long course, with slight improvement under treatment.

(4) The great tolerance to atoxyl.

DISCUSSION.

Fleet-Surgeon BASSETT-SMITH explained that it was a non-operative case. The Leishman bodies were present in the liver, spleen and bone-marrow, and possibly several other organs; so that the treatment was to give some form of arsenical preparation which was known to act upon these bodies. The kala-azar body was not a parasite which was free-swimming in the plasma, but was intracellular, hence the difficulty of killing the organism in the body was immensely increased; the aim was slowly, but continuously, to bathe the parasite in arsenical preparations, and this he was doing, and at the same time was giving the patient a vaccine from his own organism. The fact that he had been under treatment nine months without going back was a hopeful one.

Dr. WHIPHAM asked whether the exhibitor drew any hard-and-fast line between the infantile and the adult forms of kala-azar. At the last meeting of the Children's Section¹ he showed a case in a child which came from Calcutta. He believed it was said that the infantile form came chiefly from the Mediterranean, and the adult form from India; but from his reading he could not make out any particular difference between the two.

Fleet-Surgeon BASSETT-SMITH replied that originally the Indian form was recognized as distinct from the Mediterranean form on three facts: (1) The Indian form affected adults more than children, and the Mediterranean form children under the age of 5 rather than adults; (2) the parasite was not traceable to any other vertebrate, but the Mediterranean form was found in dogs, but not so the Indian; (3) that the Indian form was cultivatable on different media from the Mediterranean. These three methods of differentiation were now no longer certain, and the idea was gaining ground that it was one form, but affected differently various populations, probably on account of variants in environment.

Case of Splenomegaly with Gastro-intestinal Hæmorrhages.

By JAMES GALLOWAY, M.D.

THE patient, A. O. G., is now between 28 and 29 years of age, is married, has no children, and has been in active occupation as a meat salesman. He is of medium height, fair, pallid complexion, and stout build. He was in his usual health till shortly before January 26, 1913, when after supper, and preceded by a feeling of sickness, hæmatemesis of the most alarming character occurred. The blood vomited on this occasion

¹ *Proceedings* (Child. Sect.), p. 63.

measured several pints. The attack of hæmatemesis was not associated with pain, but its severity left the patient almost exsanguine. He was seen by Dr. R. D. Muir, and was treated by means of neutral saline injections *per rectum* and subsequently by rectal feeding. Shortly afterwards marked distension of the abdomen occurred, which was thought to be due to tympanites, and as the abdominal distension disappeared a fullness was observed on the left side, which was found to be the spleen. He was seen by Dr. Galloway in consultation with Dr. Muir on March 11, 1913.

On examination the spleen was distinctly palpable, the anterior margin projecting below the costal edge about 3 in. towards the umbilicus. No other indication of organic disease could be ascertained, especially no sign of portal obstruction nor enlargement of the liver. He had lost a large amount of weight since the hæmorrhage. It is stated that before his weight, including clothes, was 13 st. 4 lb.—on March 11, 11 st. 9 lb. with clothes. The urine was normal. The blood had recovered from the effects of the severe hæmorrhage and on examination gave the following results: Rouleaux formation, slightly increased; fibrin formation, somewhat diminished; red cells, 4,061,000 per cubic millimetre; hæmoglobin, 64 per cent.; colour index, 0·8; leucocytes, 3,100 per cubic millimetre; polymorphonuclears, 67·5 per cent.; small lymphocytes, 14 per cent.; large lymphocytes, 15·5 per cent.; large hyaline, 2 per cent.; eosinophiles, 1 per cent. Stained red cells show very little abnormality.

The diagnosis made was splenomegaly of Banti's type (splenic anæmia).

He was again seen in consultation on June 20, 1913, having been in Brighton in the interval. His weight was 11 st. 1 lb. with clothes. He looked in much better health, not so pallid. There had been no further hæmatemesis, but he had had occasional epistaxis. Bruises occur on the skin on very slight injury. He felt well, had returned to business and was doing nearly his usual amount of work. The spleen, still enlarged, extended from 3½ to 4 in. from the costal margin towards the umbilicus. The blood showed 5,000,000 red blood cells per cubic millimetre.

On July 14, 1913, he still remained in good health, was active in his work, but a tendency to easy hæmorrhages from the gums was noted, and easily produced bruises on the surface. The spleen, enlarged, extended about 3¼ in. from the costal margin towards the umbilicus. The liver was not enlarged. The blood showed about 5,000,000 red blood

cells and gave a negative Wassermann reaction. Weight (June 22), 11 st. 9 lb. with clothes.

On October 30, 1913, the patient was seen in consultation by Dr. Muir, Dr. Galloway, and Sir William Osler. His condition was practically the same as on the two previous occasions. He was still doing a considerable amount of work, greatly interested in his occupation and fairly active physically. The diagnosis of splenomegaly, of Banti's type, was confirmed. Treatment by removal of the spleen was carefully discussed, but it was decided not to operate at the present time. He had been having treatment by means of the internal administration of cacodylate of sodium in courses of a fortnight's duration— $\frac{1}{2}$ gr. daily, with a week's interval between each course. It was decided that an experimental course of treatment by means of irradiation of the splenic area by X-rays should be carried out.

On November 17, before treatment by X-rays was commenced, the following was the condition of his blood: Rouleaux and fibrin formation, normal; hæmoglobin, 80 per cent.; red blood corpuscles, 4,737,000 per cubic millimetre; colour index, 0·8; white blood corpuscles, 2,000 per cubic millimetre; finely granular oxyphiles, 56·6 per cent.; small lymphocytes, 11·6 per cent.; large lymphocytes, 10 per cent.; eosinophiles, 1·6 per cent.; large hyaline, 18·6 per cent.; transitionals, 1·6 per cent.

X-ray exposures were given on November 17, 20, 24, and 28, by filtered irradiation, the tube 8 to 12 in. from the skin, the time of each exposure ten minutes, and the current 3 to 4 ma. (secondary). After the first exposure the condition of the blood was as follows: Rouleaux and fibrin formation, poor; hæmoglobin, 80 per cent.; red blood corpuscles, 3,700,000 per cubic millimetre; colour index, 1·08; white blood corpuscles, 1,820 per cubic millimetre; finely granular oxyphiles, 61·5 per cent.; small lymphocytes, 15·5 per cent.; large lymphocytes, 15·5 per cent.; eosinophiles, 2 per cent.; large hyaline, 3 per cent.; transitionals, 3 per cent.

After two exposures, the condition of the blood was noted as follows: Rouleaux and fibrin formation, normal; hæmoglobin, 85 per cent.; red blood corpuscles, 3,500,000 per cubic millimetre; colour index, 0·9; white blood corpuscles, 1,600 per cubic millimetre; finely granular oxyphiles, 62·66 per cent.; small lymphocytes, 25 per cent.; large lymphocytes, 9·33 per cent.; eosinophiles, 2 per cent.; large hyaline, 0·66 per cent.; myelocytes, 0·33 per cent. One normoblast seen while counting 300 leucocytes.

On December 1, after the fourth exposure, the condition of blood

was as follows: Hæmoglobin, 80 per cent.; red blood corpuscles, 3,900,000 per cubic millimetre; colour index, 1·09.

The treatment by X-rays was then stopped on account of the evidence of deterioration of the blood, both as regards the number of red blood cells and the number of leucocytes, and also because the patient did not appear to be so well.

On December 18 the condition of the blood had somewhat improved: Hæmoglobin, 75 per cent.; red blood cells, 4,031,000 per cubic millimetre; colour index, 0·9; white blood cells, 1,400 per cubic millimetre.

The patient still remained under observation, but did not appear to be in quite such good health, though he still was able to do a fair amount of work.

On January 15, 1914, after having been troubled all day with flatulence, associated with constipation, a condition which had given a good deal of trouble during the past year, a rectal enema was given by the nurse for the purpose of relieving the constipation. An ordinary result followed. About 10 o'clock he had an attack of retching, and brought up a small quantity of bright blood, and after this every hour during the night he passed dark, blood-stained stools.

On the morning of January 16 he felt sick, and about 9 o'clock vomited $\frac{1}{2}$ pint of blood, later on $1\frac{1}{2}$ pints.

It was decided to bring him to Charing Cross Hospital, and during the journey he brought up a large quantity of blood, $1\frac{1}{4}$ pints being measured, while more had been caught in towels and handkerchiefs. It is supposed that he brought up $4\frac{1}{2}$ pints. On being kept at rest the hæmorrhage ceased, though profuse melæna resulted, and lasted for some days. He gradually began to improve in condition.

On January 23, 1914, the state of the blood was as follows: Rouleaux and fibrin formation, fair; hæmoglobin, 42 per cent.; red blood cells, 1,642,000 per cubic millimetre; colour index, 1·3; white blood cells, 1,620 per cubic millimetre; finely granular oxyphiles, 68·25 per cent.; small lymphocytes, 23·75 per cent.; large lymphocytes, 3·75 per cent.; coarsely granular oxyphiles, 2·50 per cent.; coarsely granular basophiles, 0·25 per cent.; large hyaline, 1·5 per cent. While counting 400 white blood cells, 4 megaloblasts and 8 normoblasts were seen, with microcytes and megalocytes. Poikilocytosis and polychromatophilia present.

The treatment consisted of rest, neutral saline infusions *per rectum*: later, rectal feeding, and gradually a return to fluid and food by the

mouth. The spleen was noted on admission to extend about 3 in. from the costal edge towards the umbilicus. The edge of the liver could be made out, but not very certainly, below the costal margin.

On recovering from the effects of the hæmorrhage, abdominal distension was observed, and gradually free fluid was noted to be present in the abdominal cavity, increasing in amount. There was no pain, no rise of temperature, the urine was normal, and there were no other obvious symptoms of disease.

No jaundice has been observed at any time while the patient has been under observation, but he says that he suffered from an attack of jaundice of short duration some years ago.

The patient left the hospital on Thursday, February 5, at his own request, and is now being treated at his own home.

[The operation of splenectomy was successfully performed on March 10, 1914, by Mr. Stanley Boyd. The number of red blood cells rose the next day to 2,300,000.]

DISCUSSION.

Dr. GALLOWAY said that if time had permitted he would have liked to have discussed the case from the points of view suggested by Sir Bertrand Dawson, but he must content himself with concentrating the attention of Fellows present on the question whether he should take the responsibility of advising this patient to have his spleen removed. Dr. Galloway thought that it might be taken for granted that this patient suffered from splenic anæmia of the Banti type. Almost exactly a year ago the patient had his first hæmorrhage, of an extraordinarily profuse character. Subsequent to the hæmorrhage the condition of his blood and his health rapidly improved. When he was seen in consultation with Dr. Muir and Sir William Osler, in October, his blood, with the exception of the persistent leucopenia, had come very near the normal condition; at any rate, so far as could be judged by the condition of the red blood cells and hæmoglobin. Bearing in mind the extraordinary profuseness of the hæmorrhage, which arose, no doubt, from enlarged veins in the mucous membrane of the stomach, or at the lower end of the œsophagus, and also that he had a tendency to easy bleeding from the gums, to epistaxis, and for bruises to appear upon slight cause, and also that he was then in very good condition and able to perform his usual duties, it was decided not to operate. He had previous to this date been under careful treatment by means of sodium cacodylate, and it was then decided to use carefully a course of X-ray treatment. The application of the X-rays seemed, however, to do definite harm, and it was soon stopped. About a month ago a second enormous hæmorrhage occurred, showing itself by hæmatemesis and melæna. While recovering from this attack the abdomen began to swell, and about a fortnight

ago the presence of free fluid in the abdominal cavity was noted. The amount rapidly increased till the present condition of greatly distended abdomen, due to marked ascites, was produced. It was worthy of consideration whether this rapidly growing ascites was due to cirrhosis of the liver, of which there had been no evidence up to the time of onset of the ascites, or whether it was due to partial thrombosis of some of the veins in the portal circulation. Under these circumstances, he invited the opinions of his colleagues as to whether the operation of removal of the spleen was justifiable, and as to the prospect of the operation: First, while it was being carried out; secondly, subsequent to its successful completion; and, finally, as to the chances of cure resulting from removal of the spleen.

Mr. W. D. SPANTON said, with regard to the question of operation, he thought it might be of interest to call the attention of the Section to the fact that a certain number of operations had been done on the spleen; and, in 1895,¹ he published a paper, which referred to the whole of the recorded cases in various periodicals, foreign and English, up to that date. The number was just 100. Twenty-five of these were recorded as cases of operation in leucocythæmia, and they all but one died. One of the cases comprised in the list was said by Mr. Knowsley Thornton to be simple hypertrophy, so one might conclude that that case would recover. The remaining seventy-five cases comprised hypertrophies, wandering spleens, rotated spleens, lympho-sarcoma, cystic and other causes, including injury. Of the forty-nine cases of hypertrophy, twenty-six died; of the wandering spleens, only one out of fourteen died. There were two examples of rotated spleens, and both recovered, and all four cystic cases recovered. Of the other cases, one out of four recovered. The cases began in the year 1549, by Zaccharelli, and the first one recovered. In the early days, in the then stage of surgical technique, he contended that the operation was hardly justifiable. But as surgery progressed it became a more and more justifiable procedure. The range covered by the 100 cases was from 1549 to 1895. Of the second series, the seventy-five hypertrophies, &c., there were only seventeen English cases. The first of these was done by Sir Spencer Wells, in 1865. The second one was done for hypertrophy, and the tumour weighed 1 lb. 14 oz. That patient recovered. He (Mr. Spanton) had the third case in England, followed by two others, one of which was successful. Those three cases comprised the three largest tumours which had been operated upon in England up to that time. In 1895, when his paper was read, Sir John Bland-Sutton had had one case in 1892, which had recovered, and three cases in 1895, all of which recovered. In the first decade, 1866-75, there was a mortality-rate of 75 per cent. In the second decade, 1876-85, the mortality-rate was 59 per cent. In the third period, 1886-95, the mortality was only 16 per cent. So, with the progress of surgery, the operation was not nearly so formidable as in the past, and that fact should encourage operation, even in what would formerly have been considered somewhat doubtful cases.

¹ *Brit. Med. Journ.*, 1895, ii, p. 1090.

Sir BERTRAND DAWSON said he thought his own case, L. L. (*see* p. 105), had a bearing on Dr. Galloway's case. The patient presented a very remarkable picture when she first came to the hospital, that of extreme chlorosis. Before then she had had two bad attacks of hæmatemesis. He thought at first it was a case of splenic anæmia, but he now had doubts as to that; she recovered from her anæmia much too quickly, and it looked as if her anæmia was the result of the hæmorrhage. He had never known splenic anæmia go from 2,000,000 odd red corpuscles to 5,000,000 odd in less than six weeks' treatment. She had had preliminary febrile illnesses and she had been made prostrate by hæmorrhages. She was well for over a year, and then had another big hæmorrhage, and again became extremely anæmic, with leucopenia. She had marked ascites, a big hard spleen, and the liver could be felt, on deep inspiration, to be extremely hard. The ascites occurred twice in three years. On the first occasion it was tapped two or three times and got better; on the second occasion it did not need to be tapped. At the operation not only was there a big spleen, but there was a hard cirrhotic liver split up into islands, very much resembling a lobulated pig's kidney. If one saw a liver like that in the days before the Wassermann test one would have said it was syphilis, but he was convinced it was not due to syphilis in this case: there was no suggestion of that disease in the patient or in the family; and nowadays, if the Wassermann test was negative one could be certain there was no syphilis. The Wassermann test, properly done, was extraordinarily accurate. This patient was now going about in perfect health, prosecuting her employment, and in a couple of months intended to get married. It was less than two years since her last hæmatemesis, and possibly some day he would hear that she had had another hæmorrhage. In some respects this case was a parallel to Dr. Galloway's. Why such a patient who had had ascites and hepatic cirrhosis should get better by removal of the spleen was difficult to explain. He should encourage Dr. Galloway to have excision done in his case.

Dr. PARKES WEBER said that, since the ascites had developed, Dr. Galloway's case seemed, from the clinical point of view, to be one of the third stage of splenic anæmia; in other words, it was now one of advanced "Banti's disease." The ascites would anyhow have to be tapped soon, and he suggested an exploratory laparotomy. If it were then found that the condition of the liver was better than expected, and the spleen seemed capable of easy removal, he advised splenectomy. Otherwise, it would be well to do an omentopexy, and to drain the peritoneal cavity, under the most careful antiseptic precautions.

Dr. HUGH THURSFIELD said he would like to put the case of Dr. Galloway's patient in the briefest possible words. The patient had had two severe attacks of hæmatemesis. What would be his fate if nothing were done for him? Almost certainly death from another hæmatemesis within two or three years. He could not look forward to life much beyond that time. On the other hand, if the spleen were excised now, although there was already some evidence of

liver involvement, the statistics available for the last ten years tended to show that he would have at least a 50 per cent. chance of good health for many years afterwards. Therefore he would say, without hesitation, to Dr. Galloway—have his spleen removed at the earliest possible date.

Case of Splenic Anæmia with Ascites, treated by Splenectomy and Omentopexy.

By HUGH LETT, F.R.C.S.

THE patient, M. S., a girl, aged 17, was admitted to the London Hospital under the care of Dr. Hadley in September, 1909. She was undersized and intellectually somewhat dull. She was employed as a milliner's assistant. For nine months the abdomen had been steadily enlarging, and she had been growing more and more anæmic, with corresponding loss of energy. She had suffered from epistaxis and had had several attacks of hæmatemesis.

On admission to the Hospital she was very anæmic. The spleen was considerably enlarged, its lower border reaching to the level of the anterior superior iliac spine. The abdominal wall was tense from the presence of a large amount of free fluid in the peritoneal cavity. No enlargement of the lymphatic glands could be detected.

On September 10 an examination of the blood gave the following result :—

Red cells	...	...	...	...	2,150,000 per c.mm.
Hæmoglobin	...	...	...	...	25 per cent.
Colour index	...	...	...	...	0·6.
White cells	...	...	...	...	3,600 per c.mm.
Poikilocytes present, and very occasional normoblasts.					
A relative lymphocytosis.					

Splenectomy: On September 28 I removed the spleen through an incision in the left linea semilunaris. The chief point of interest in the operation was the condition of the splenic veins. They were very large and their walls were much thickened, but so pliable that extreme care had to be exercised to prevent the ligatures cutting through the walls of the veins. The various vessels in the pedicle were ligatured separately. The spleen had no abdominal adhesions and the operation was practically bloodless and unattended by shock. The liver was smaller than normal.

Subsequent progress was uneventful as far as the wound was concerned; healing took place by first intention.

Omentopexy: Free fluid began to re-accumulate in the abdomen within a few days of the operation, and with a view to relieving this, omentopexy was performed on November 1, five weeks after the removal of the spleen. An incision 3 in. long was made to the right of the middle line above the umbilicus. The upper surface of the liver and neighbouring surface of the diaphragm were vigorously rubbed with gauze. The omentum was spread out across the abdomen and secured by silk to the posterior aspect of the anterior abdominal wall as widely as possible. The wound was closed and a Keith's tube placed through a button-hole suprapubic incision into Douglas's pouch.

Subsequent progress: Ascitic fluid escaped freely through the tube for the first two days, then gradually diminished, and the tube was finally removed at the end of a week. The upper wound healed without interruption by first intention.

Pathological Report by Dr. Turnbull (S.D., 673, 1909).—Spleen received whilst still warm. It had the consistency of soft rubber. The external surface measured 8 in. from above down and 6 in. from side to side at its widest—i.e., near its lower end. The anterior surface measured 7 in. from above down and $3\frac{1}{2}$ in. from before back at its broadest—i.e., near the upper pole. The inner or posterior surface measured 7 in. by 4 in. This surface was divided by a deep fissure running from above and behind, downwards and forwards, so that two lobes were formed. On the anterior border were two deep, and below these two shallow, notches. The surface was of a pink colour with, in places, a very slight grey opacity of the capsule and a few groups of pinhead, white, papillary thickenings, especially on the external surface. On section, 7 oz. of dark red blood almost spurted out. The capsule appeared as a thin line. The cut surface did not bulge, but was perfectly flat, and of a soft, rubbery consistency; it was deep red in colour, with very fine, white trabeculæ and small, round, raised, glistening Malpighian bodies, in size up to half a pin's head. There was perhaps a slight increase in the number of the fine trabeculæ per unit of surface area. The Malpighian bodies were rather small and scanty. Weight: 2 lb. 1 oz., plus 7 oz. of blood.

Microscope: Enlarged Spleen with Reticular Sclerosis.—Two sections. The capsule is slightly thickened, and its internal edge is not sharply limited. The trabeculæ are very large and numerous. Both capsule and trabeculæ are full of elastic fibres. The Malpighian bodies are relatively few in number but of good size. Their centres are darker than the periphery, the leucocytes in the centre being slightly

smaller and their nuclei deeper stained. In several there are three zones, a third pale area lying round the central arteriole. This central zone consists of cells with considerable protoplasm, and with nuclei which are two to four times as large as the lymphocytes in the adjacent zone. The nuclei are very pale with a fine nuclear membrane, very few chromatin fibrils and generally a large nucleolus; karyokineses are seen here. These cells are ill defined, and patches of pale hyaline substance lie amongst them. Nuclear fragments are also present. These central zones, therefore, are areas of "central necrosis." The arterioles are small and not surrounded by fibrosis. Hyaline nodules representing destroyed Malpighian bodies are not seen. The pulp shows the most obvious change. The capillary veins are for the most part empty, and the pulp strands between them form under a low power a very distinct net. The pulp strands consist almost entirely of reticulum cells with elongated nuclei; only occasionally are some collagen fibrils visible. The pulp strands contain few free cells. There are also few free cells in the capillary veins. Of the free cells, the majority are lymphocytes, but eosinophile leucocytes are present in large numbers. Four or more plasma cells can be seen in every field ($\frac{1}{12}$ in.) when the sections are stained by the Unna-Pappenheim method. Excepting the presence of one or two eosinophile myelocytes, there is no sign of myeloid or lymphadenoid transformation (Jenner's stain).

Results of the Two Operations.—The changes in the blood following the removal of the spleen can best be seen by comparing the following tables. The operation was performed on September 28, and on September 30 the blood was as follows:—

Red cells	...	...	...	...	3,287,500 per c.mm.
Hæmoglobin	...	...	...	...	40 per cent.
Colour index	...	...	...	...	0.6.
White cells	...	...	...	...	9,700 per c.mm.
Large numbers of nucleated red cells.					

The red cells had increased from 2,150,000 to 3,287,500, that is, by more than 60 per cent., the hæmoglobin from 25 to 40 per cent. The colour index remained unaltered. The white cells had increased to 9,700 and there were large numbers of nucleated red cells.

On October 8:—

Red cells	...	...	...	...	3,637,500 per c.mm.
Hæmoglobin	...	...	...	...	45 per cent.
Colour index	...	...	...	...	0.6.
White cells	...	...	...	...	12,240 per c.mm.
Normoblasts fairly numerous.					

On January 6, 1910, the blood examination gave the following result:—

Red cells	...	...	...	...	4,935,000 per c.mm.
Hæmoglobin	...	...	...	...	70 per cent.
Colour index	...	...	...	...	0·7.
White cells	...	...	...	...	9,700 per c.mm.
No nucleated red cells.					

After the operation the patient remained well for one year and two months. There was no return of the epistaxis or hæmatemesis nor of the ascites.

She came up to see me again in December, 1910, as she had just had an attack of hæmatemesis, the first time since September, 1909. Dr. Panton kindly examined the blood again and reported as follows:—

Red cells	...	...	...	...	6,000,000 per c.mm.
Hæmoglobin	...	...	...	...	80 per cent.
White cells	...	...	...	...	13,000 per c.mm.
Slight excess of eosinophiles, and an occasional nucleated red blood corpuscle.					

Unfortunately I then lost sight of her, but she returned to the Hospital a year later, in December, 1911, with hæmatemesis and melæna. She gave a history of occasional epistaxis, but denied any dyspeptic symptoms. Broncho-pneumonia supervened, and she died five days after her admission to Hospital. An examination of her blood showed:—

Red cells	...	...	...	...	3,150,000 per c.mm.
Hæmoglobin	...	...	...	...	40 per cent.
Colour index	...	...	...	...	0·6.
White cells	...	...	...	...	70,000 per c.mm.
Polynuclears	...	...	...	...	77·8 per cent.
Small lymphocytes	...	...	...	...	11·8 „
Large lymphocytes	...	...	...	...	2 „
Hyaline	...	...	...	...	1·6 „
Coarsely granular	...	...	...	...	0·2 „
Myelocytes	...	...	...	...	6·6 „
Rouleaux formation poor; poikilocytosis distinct.					

As this case presents several unusual features, I ventured to think it might be of some interest to members of this Section, and have therefore reported it to-night. In the first place, the case is of interest in that the patient was in the third stage of Banti's disease at the time of operation, for extremely few cases of operation in this stage have

been reported. The result of the splenectomy was good. Two days after the operation the red cells had increased to more than 60 per cent., the hæmoglobin had increased by 57·5 per cent., and the white cells had nearly trebled. The improvement was maintained and the blood picture gradually became normal. The result of the omentopexy was satisfactory in that it permanently cured the ascites, and apparently prevented a recurrence of hæmatemesis for over a year. But it was unsatisfactory, in that the hæmatemesis did finally recur and was indirectly the cause of death.

The net result is that the patient lived two years and two months after operation; that for the first year she remained entirely free from symptoms of the disease, and that the blood became normal. For the remaining fourteen months she suffered from a recurrence of hæmatemesis, although the ascites was cured and did not return. Her life was probably prolonged and she certainly lived for a year in comfort. At the same time her mother did not think that the patient received great benefit from the operation. She was never strong and did not return to work. It must, however, be remembered that she was at best a weakly, undersized little creature.

It is intensely disappointing that no post-mortem examination was made. When the patient was admitted to the Hospital five days before she died she went into one of the medical wards, and the interest of the case, at any rate from a surgical point of view, was not appreciated.

Hæmolytic Jaundice ; Cholecystotomy ; Splenectomy ; Cure.

By Sir BERTRAND DAWSON, K.C.V.O., M.D.

E. W., FEMALE, aged 22. Icteric tinge for six years, but no feeling of ill-health except indigestion at times. About three years ago was in bed with jaundice, accompanied by the usual malaise and digestive disturbance, but no pain.

October, 1913: Recurrence of jaundice. Seen by Dr. Watson, of Leigh-on-Sea, who discovered a palpable spleen, and patient was sent to the London Hospital. On admission, obvious jaundice of skin and conjunctivæ; bile pigment in urine; temperature 99·5° F.; no pain, no tenderness; spleen enlarged to umbilicus. The blood report was as follows: Erythrocytes, 4,000,000; hæmoglobin, 45 per cent.; colour

index, 6; leucocytes, 10,000. Differential count as follows: Polynuclear neutrophiles, 64·5 per cent.; polynuclear eosinophiles, 0·5 per cent.; small lymphocytes, 15 per cent.; large lymphocytes, 15 per cent.; large hyaline cells, 3 per cent.; coarsely granular basophilic cells, 0·5 per cent.; finely granular basophilic cells, 0·5 per cent.; neutrophilic myelocytes, 1 per cent. Fifteen normoblasts seen while counting 200 leucocytes. Poikilocytosis and anisocytosis present.

In about ten days the symptoms had passed, the yellow colour had diminished, and the condition returned to the permanent icteric tinge of conjunctivæ and skin, but bile pigment was absent from the urine. Wassermann's test negative. The lips were dark red; the palate a little pale.

Estimation of fragility by Dr. Panton: The red corpuscles are definitely fragile, hæmolysis commencing at 0·6 per cent. saline solution, and being complete at 0·5 per cent.; whereas with normal blood done at the same time hæmolysis began at 0·4 per cent. and was complete at 0·3 per cent. The serum contained bile pigment; the urine no bile pigment, but an excess of urobilin.

Careful inquiry disclosed no relative in this or preceding generations similarly afflicted. This patient had had biliary attacks, so the probability was that the gall-bladder was secondarily affected. Patients with hæmolytic jaundice are liable to intercurrent attacks of digestive disturbance with fever, during which the jaundice often deepens. These take origin from the gall-bladder, the conditions being favourable to the formation of biliary calculi or mud. Accordingly, I asked Mr. Furnivall first to cut down on the gall-bladder. Four gall-stones were removed. At the same time the spleen and liver were felt, but on the whole it was deemed wise to defer the splenectomy to a later period.

The patient made a rapid recovery. She was examined afresh. The mild icterus persisted; the urine contained no bile, but excess of urobilin; the serum contained bile pigment. The red cells were unduly fragile, hæmolysis occurring in salt solution of strength up to 0·7 per cent. The patient's red cells were very slightly hæmolysed by normal serum, whereas the patient's serum had no hæmolytic action upon normal red cells.

One month after the first operation Mr. Furnivall excised the spleen. The patient made a good recovery. A week after the operation the icteric tinge had greatly lessened. Two weeks later the jaundice had gone from skin and conjunctivæ; the urine no longer showed excess of urobilin; the serum was free from bile pigment. The fragility of the

red cells, however, remained unchanged. This accords with my experience in other cases.

The case may be regarded as hæmolytic jaundice of acquired type, though it is possible the increased fragility may have been of long standing or even have been congenital.

Hæmolytic Jaundice complicated by Cholecystitis.

By Sir BERTRAND DAWSON, K.C.V.O., M.D.

F. B. H., FEMALE, aged 27, sweet packer, single.

Family history: Nothing of interest in the family history, except that her mother is stated to have been jaundiced for a short while, without symptoms, when a girl. No other member of the family, as far as she knows, has ever been jaundiced.

Past history: Measles at the age of 5; no infectious fever, such as typhoid, scarlet fever, or mumps. Never any glandular enlargements.

History of present condition: At the age of 12 jaundice came on gradually and without symptoms, and was noticed by all her companions.

December, 1908: At the age of 21 had a sudden seizure, as follows: (1) Pain, severe, mid-epigastric, no relation to food, lasted three days; (2) vomiting, slight, without relief of pain, white mucus, no blood with retching; (3) jaundice became intense, yellow sweat, yellow nasal catarrh, deep black urine, marked constipation, white stools. She entered Newport Hospital, under Dr. Edgerton Williams, in December, 1908, and was treated with medicines, including arsenic, until February, 1909, when laparotomy was performed by Mr. Greer. Nothing was done. She left hospital on March 31, 1909, after a stay of four months altogether.

June, 1913: She had another, but milder, seizure of abdominal pain in the epigastrium, which lasted on and off for a month. The pain had no relation to food, and was not accompanied by vomiting. This time also there was marked deepening of the jaundice, the stools were white, the sweat was yellow. While in hospital what was said to be an abscess under the left breast was treated with fomentations, no incision. At the end of a month she was discharged fairly well.

Since its first incidence fifteen years ago the jaundice has never disappeared, and has twice become intense.

Present state: The patient complains of nothing but a dull pain in the left side of the abdomen—constantly present, never severe—ever since the laparotomy. Sleep good and refreshing. Urine, no frequency, no pain, natural quantity, deeply pigmented, contains no bile pigment (five examinations), a slight excess of urobilin, no albumin, no sugar. Catamenia regular every month, no excessive loss. Pruritus, only once in September, 1913, which lasted a month. No wasting. No cough. Appetite excellent. Bowels, habitually costive.

Physical examination: A well-nourished, plump, well-built brunette. Definite icterus of skin and conjunctiva. Heart: Size, position and sounds natural. Chest: Good expansion, no abnormal physical signs. Abdomen: Well covered with fat, shapely and muscular; on palpation a smooth, firm tumour is felt, extending from under the costal margin, filling the left side of the belly, and reaching beyond the mid-line and as far down as the symphysis. It has the shape, axis, edge and position of a splenic tumour. Liver not enlarged; no enlargement of any palpable glands; no ascites; no arthritis; no œdema of legs; no fever since admission to hospital one month ago. Teeth: Several recently extracted, five carious stumps remain in upper jaw; no bleeding from gums. Breath inoffensive. Stools: Natural in colour, odour, and consistency. Blood-pressure, 93 mm. Nervous system, as tested by pupils, knee-jerks, plantar reflexes, ocular movements, and optic disks, normal. Weight, 9 st. 10 lb. 8 oz. Wassermann's test negative.

Dr. Panton reported on the blood as follows; Erythrocytes, 3,350,000; hæmoglobin, 70 per cent.; colour index, 1; leucocytes, 3,400. Stained blood: Polynuclear neutrophiles, 64·5 per cent.; polynuclear eosinophiles, 6·5 per cent.; small lymphocytes, 8·5 per cent.; large lymphocytes, 15·5 per cent.; large hyaline cells, 4 per cent.; coarsely granular basophilic cells, 1 per cent.; poikilocytosis, anisocytosis, and granular degeneration present. The serum is deeply pigmented, and gives a positive Gmelin's test. The red cells are markedly fragile, hæmolysis taking place up to 0·6 per cent. normal saline.

Enlarged Spleen ; Cirrhosis of Liver ; Splenectomy.

By Sir BERTRAND DAWSON, K.C.V.O., M.D.

L. L., FEMALE, aged 19. In October, 1910, admitted to Barking Isolation Hospital as "Typhoid." Temperature $102\cdot8^{\circ}$ F., pulse 120, respiration 24. Diarrhœa with pea-soupy stools. No rash. Widal negative. Spleen found to be considerably enlarged. After six days, temperature became normal and remained so for two weeks. For the ensuing fortnight the temperature was normal, it then shot up and fever persisted for six days; then followed again fifteen days of normal temperature. After another short bout of fever the temperature settled to normal and remained so.

In December, 1910, the patient felt better and improved in general condition. Soon after, however, she developed ascites rapidly. Was admitted to the London Hospital with a distended abdomen, and 134 oz. of clear yellow fluid were withdrawn. Palpation not painful. Liver pushed upwards, not apparently enlarged. Spleen much enlarged—to the umbilicus or a little beyond it. No other lump in the abdomen.

A second Widal reaction was done—1 to 20, some clumping, but 1 in 50 and 1 in 100, no reaction.

The ascitic fluid showed a preponderance of small lymphocytes. The cultures remained sterile.

Blood: Reds, 4,000,000; hæmoglobin, 85 per cent.; colour index, 1; leucocytes, 17,000. Blood films: Polynuclear neutrophiles, 46 per cent.; small leucocytes, 32 per cent.; large leucocytes, 13 per cent.; transitionals, 9 per cent.

January 19, 1911: Temperature normal, general condition considerably improved. Spleen enlarged $\frac{3}{4}$ in. below and $\frac{1}{2}$ in. to right of umbilicus. Liver felt on deep inspiration, edge and adjacent surface being very hard. No ascites. No enlarged glands. Von Pirquet's sign showed a moderate positive reaction.

During the following year patient kept in good health, but in January, 1912, she had sudden hæmatemesis, bringing up half a pint or more on two separate occasions. She remained in bed for three weeks and then apparently recovered.

May, 1912: Another attack of hæmatemesis, this time about 2 pints. Admitted to hospital on June 8, 1912. Had the aspect of a patient

suffering from extreme chlorosis. Fluid reappeared rapidly in the abdomen but was not sufficient to require tapping. Spleen could be made out the same size as previously. No enlarged glands. Temperature normal.

On June 12, 1912, Dr. Tidy reported on the blood as follows: Erythrocytes, 2,050,000; hæmoglobin, 25 per cent.; colour index, 0·6; leucocytes, 1,600. Fresh blood: Rouleaux formation poor; macrocytes and poikilocytes present. Stained blood: Polynuclear neutrophiles, 47·5 per cent.; polynuclear eosinophiles, 1·5 per cent.; small lymphocytes, 27·5 per cent.; large lymphocytes, 13 per cent.; large hyaline cells, 10 per cent.; coarsely granular basophilic cells, 0·5 per cent. One normoblast seen while counting 200 leucocytes.

Von Pirquet's cutaneous reaction positive. Wassermann's test negative. The family history contained nothing suggestive of inherited syphilis.

Patient slowly improved, and by the beginning of August had regained a good deal of her colour, and her blood showed: Red cells, 5,407,000; hæmoglobin, 75 per cent.; colour index, 0·7; white cells, 6,600.

On August 7 splenectomy was performed by Mr. Frank Kidd. The abdomen was opened by a vertical incision on the left side of the middle line. A small amount of fluid escaped. The spleen was greatly enlarged and was attached behind to the diaphragm by adhesions which contained distended thin-walled veins. The stomach was examined and found to be normal. The liver was small and hard, due to fibroid change; its surface consisted of large irregularities somewhat resembling a lobulated pig's kidney. No evidence of tubercle was found, though the incision was not favourable to a search in the lower abdomen. Patient made an uninterrupted recovery.

By the end of October she had greatly improved in appearance, and her blood count showed: Reds, 6,450,000; hæmoglobin, 92 per cent.; colour index, 0·7; leucocytes, 5,000.

In May, 1913, her health was excellent, and her blood count was practically the same as the foregoing.

The patient at the present time is enjoying perfect health, goes regularly to work, and is soon to be married.

A report on the excised spleen by the Pathological Institute of the London Hospital described the changes as those of chronic inflammation, and no amyloid change was present.

Enlarged Movable Spleen (Splenoptosis) in a Case of Early Graves's Disease.

By R. MURRAY LESLIE, M.D.

G. T., A MARRIED woman, aged 53. There are ten children alive and well. Has suffered for twelve months, from general debility and exhaustion, which patient attributes to an attack of influenza. There is a history of congestion of the liver ten years previously. Patient has been in the habit of taking one glass of spirits daily. There has been a gradual loss of weight during the past six months, and four weeks before admission there was œdema of the legs. There was an attack of shivering and vomiting a week before coming under observation. Was admitted to Prince of Wales's Hospital on January 3, 1914.

Present condition: An enlarged spleen is palpable in the left half of the abdomen. It is extraordinarily mobile and can be readily moved about in all directions. There is no special tenderness.

Blood examination: Erythrocytes, 3,432,000 per cubic millimetre; leucocytes, 6,200 per cubic millimetre (small lymphocytes 24 per cent., large lymphocytes 12 per cent., polymorphonuclear cells 52 per cent., eosinophiles 2 per cent., mast cells 4 per cent.).

Evidence of Graves's disease: There is enlargement of both lobes of the thyroid gland, some exophthalmos, tachycardia, and palpitation, and also a general fine tremor.

Urine on admission had a specific gravity of 1020 and contained some albumin and granular tube casts, both of which have now disappeared. There is a slight enlargement of the liver with a faint icteric tinging of the conjunctivæ, suggestive of hepatic cirrhosis.

An exploratory laparotomy is now under consideration.

Splenomegaly ; Two Attacks of Hæmatemesis ; Irregular Liver.

By Sir WILLIAM OSLER, Bt., F.R.S.

(For E. J. F. HARDENBERG.)

Two children in family, patient the elder of the two ; born prematurely. No snuffles, no rash. Mother healthy ; only one miscarriage, other child well. The lad has always been pale ; never quite up to his age standard in growth ; no jaundice. In August, 1913, hæmatemesis ; greatly enlarged spleen discovered ; marked anæmia followed. On January 2 another severe attack ; since then he has improved, though still pale. Blood count, February 7 : Red blood corpuscles, 4,100,000 ; hæmoglobin, 58 per cent. Differential count: Polymorphonuclear neutrophiles, 57·5 per cent. ; small lymphocytes, 25 per cent. ; large lymphocytes, 7·5 per cent. ; large mononuclears, 5·5 per cent. ; eosinophiles, 1·5 per cent. ; mast cells, 3 per cent.

On examination, no luetic stigmata ; the fingers are not clubbed ; the spleen reaches to the navel, smooth, not painful, freely movable. In the liver the special point to be noted is the prominence in the parasternal line, which projects a considerable distance beyond the liver edge in the nipple or mammillary lines. The edge is firm and hard ; no enlargement of the liver upwards. The irregularity of the liver suggested that this case is in the category of splenomegaly secondary to luetic liver. The positive Wassermann reaction confirms this. Splenectomy is not indicated. In a case of this kind, under Dr. Coupland's care, splenectomy was performed by Mr. Pearce Gould.¹ The attacks of hæmatemesis recurred, the typical scarred luetic liver was present, with varicose veins in the œsophagus. Wassermann reaction positive.

¹ *Brit. Med. Journ.*, 1886, i, p. 1445.

Clinical Section.

March 13, 1914.

Mr. CHARTERS J. SYMONDS, President of the Section, in the Chair.

Case of Primary Squamous Epithelioma on the External Aspect of the Left Nostril, illustrating the Modern Extensive Operation for Radical Cure.

By HENRY CURTIS, F.R.C.S.

THOUGH the operation was only performed on December 20, 1913, some twelve weeks ago, and therefore a cure cannot as yet be claimed, the case and its treatment present certain features which seem to make it worth while exhibiting the patient before the Section at this stage.

(1) *As to the Nature of the Tumour.*—The short history and definite statement that there had been no previous growth of any kind, taken with the microscopic characters, negative the view that the squamous epithelioma arose secondarily to a rodent ulcer. Primary squamous epithelioma of the exterior of the nostril is apparently very uncommon.

(2) *From the Point of View of Operation.*—The case illustrates the modern operation devised in general conformity with the considerations laid down by Mr. Lenthal Cheatle, C.V.O., C.B.,¹ in planning incisions for excision of cancer from the front of the face, for the removal of the growth with, wherever possible, at least $\frac{3}{4}$ in. of skin around, and taking the entire thickness of the cheek, everything down to the bone, together with all the glands likely to be involved, *en bloc*.

Though this may sound formidable, the operation is perfectly simple, and if the face only is involved and not the nose, there is no difficulty in at once covering in the gap with a flap from the neck. The removal

¹ Burghard's "System of Operative Surgery," 1909, ii, pp. 157-66.

of the nostril, as in the present instance, creates the difficulties which arise from the raw surface of the long flap necessary having (1) to be applied over the opened-up nasal cavity, a source of sepsis; and (2) to be stitched at its edges to the skin at the bridge of the nose where the circulation being terminal, so to speak, is rather poor. It was therefore not surprising to find that this terminal portion of the flap, where employed to form a new nostril, sloughed. A second small plastic operation has, I think it will be agreed, considerably improved the appearance of things.

History: The patient, a healthy-looking man, aged 43, was admitted to hospital under the care of a colleague on November 12, 1913, for



FIG. 1.

Primary squamous epithelioma of the left nostril.



FIG. 2.

Condition after the second operation.

a painless tumour on the left side of the tip of the nose. It had appeared spontaneously as a small pimple one month earlier. There had been no excrescence there, of any kind, previously. As the result of scratching, the swelling had broken down a fortnight before admission, when it was noted to be of the size of a "small gooseberry," and having the diameter the size of a sixpence. It was fungating and septic on the surface. It was not indurated around the base, nor at its edges, which were not raised, but merged into the surrounding skin. The swelling as a whole was quite soft, almost fluctuating. The pre-auricular and cervical glands were not palpable. Some enlarged glands

were detected in the right and left submaxillary triangles. On incising the tumour some pus appeared and fomentations were applied. A provisional diagnosis of sebaceous growth was made. Stained films of the pus formed an almost continuous mass of cocci and bacilli. No trace of actinomycotic filaments. Wassermann's reaction was negative. By December 1, when the case came under my care, the tumour had become slightly larger, and appeared to be spreading uniformly at the edges. The submaxillary lymphatic glands were small and hard. By December 7 the growth was much larger than on admission. Two days later a portion of the edge of the growth was excised, and on December 15 the sections were reported to be characteristic of a

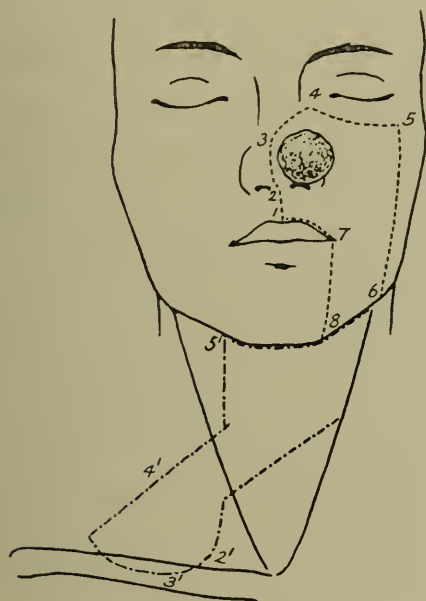


FIG. 3.

Fig. 3.—First operation.

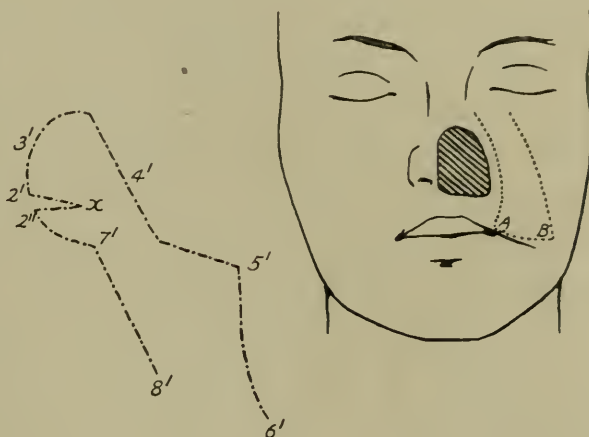


FIG. 4.

Fig. 4.—The skin-flap shown in fig. 3, rotated into position, and its apex slit (2' and 2''), to form a new nostril and left upper lip. The dotted figures, 2', 3', &c., indicate how the flap corresponds with the gap at 2, 3, &c., in fig. 3.

Fig. 5.—Second operation. The new flap with apex A B at level of exuberant fold at left angle of mouth, which was thereby obliterated.

FIG. 5.

squamous cell carcinoma, and revealed no evidence of it having originated as a rodent ulcer.

Operation by Henry Curtis, December 20, 1913: Trendelenburg position, to prevent inspiration-pneumonia. The incision (fig. 3, 1-6) commenced in the median line of the upper lip, just above its red margin, and, proceeding upwards along the columella, was made to

deviate towards the right side of the tip of the nose, skirting the growth on this side, and crossing the bridge of the nose towards the left eye a good $\frac{3}{4}$ in. above the upper margin of the tumour. Then with a curve, having its concavity upwards, the cut extended just below the left infra-orbital margin outwards to just beyond the anterior limit of the left masseter muscle, descending thence in a slightly forward direction to the lower border of the mandible. From the beginning of the incision in the median line of the upper lip, a second incision was made, just skirting the red margin of the lip to the left angle of the mouth, and thence vertically downwards to reach the lower border of the mandible. The incision over the columella extended to the cartilage, elsewhere the incisions went down to the bone, so that the flap included the entire left nostril and the whole thickness of the cheek, exposing both nasal and mouth cavities. The reflected flap was wrapped in gauze wrung out of 1 in 20 carbolic acid lotion to prevent wound infection. The two vertical incisions (5-6, 7-8) limiting the base of the flap at the lower border of the jaw were then joined by an incision (6-8) only skin deep, so that the cheek flap might be removed with the lymphatics and glands involved, *en masse*. Those removed consisted of the left maxillary glands, just below the orbit, the lymphatic vessels (and ? glands) in the left buccinator region, both submaxillary salivary and lymphatic glands, both submental glands, and the left superficial and deep cervical glands. To expose the glands below the jaw and provide for the flap to cover in the gap in the cheek and nose, the skin incision along the lower border of the jaw was then continued forward to a little beyond the middle line (6-5'), the total length of this skin cut a little exceeding (so as to allow for shrinkage) the almost vertical incision over the anterior border of the left masseter, to which it was later to be applied. From the free extremity of this skin cut an incision was made down the neck, at first vertically to just below the level of the hyoid bone, then crossing obliquely downwards and to the right posterior triangle, at about the junction of the lower and middle thirds of the anterior border of the right sternomastoid, and reaching to within one finger's breadth of the outer part of the clavicle, thence turning inwards along the upper border of the middle third of that bone to form the free end of the long flap, and so gradually passing upward towards the base, crossing the middle line to reach the anterior border of the left sternomastoid about a third of the way down the neck. The neck flap was rotated so as to fill in the gap to which it was sutured, and its apex split (*a*) to form the new left nostril with smooth skin-covered margin

moulded around a drainage-tube stitched to the floor of the left nasal fossa, and (b) to supply the deficient left upper lip. This is made clear in the diagrams, figs. 3 and 4. The huge gap in the neck came together in a most satisfactory way, after undercutting the upper part of the left edge of the wound. Free drainage was arranged. Although septic infection of the neck was inevitable, union was not materially delayed. The apex of the flap sloughed, but the shrinkage of the gap in the nose proceeded so rapidly and with comparatively so little disfigurement that in this respect the patient was not at all anxious to have anything further done to improve his appearance. On February 4, however, six and a half weeks after the first operation, a second attempt was made to close in the gap and supply a new nostril, the previous failure being considered largely due to the inadequate circulation in this region. A new flap was made (fig. 5), having its base in the angle between the left side of the bridge of the nose and the infra-orbital margin, the apex (*A, B*) being at the superfluous fold left at the angle of the mouth after the first operation. To improve the vascularity a flap from the septum nasi was cut, and its apex stitched to the raw surface of the turned-in skin-flap. The final result, though not beautiful, is a decided improvement on the condition left after the first operation, and I consider this largely attributable to the use of the septal flap creating a more adequate vascular supply. In a future case, however, I should attempt to secure this by utilizing the corresponding inferior turbinate, transplanting it forward and fixing it so as to fill in the gap. This would form a mechanical support for the skin-flap for the nostril, and at the same time greatly improve its vascularity. It would probably be safer not to attempt to form a new nostril at the primary operation for removal of the disease.

Sections through various regions of the parts removed show that the enlarged lowest deep cervical gland is invaded at one part of its capsule, and of the gland tissue immediately beneath by small epithelioid cells, probably indicating a very early stage of involvement in growth. The lymphatics and lymphatic glands higher up are extensively invaded with growth, confirming the necessity for removal of the entire thickness of the cheek and the involved lymphatic system by a block dissection. Recurrence is highly probable even now; it must have been inevitable had anything less radical been attempted.

Case of Spastic Smile with Tremor of the Upper Extremity and Defective Articulation.

By HILDRED B. CARLILL, M.D.

MRS. A., aged 52. At the age of 16, after extraction of two teeth, the lower jaw "came forward" and her articulation became indistinct. This condition has remained. At the age of 39, three days after her confinement, her right arm commenced to shake and has continued to do so. Two years ago patient was observed to be constantly smiling.

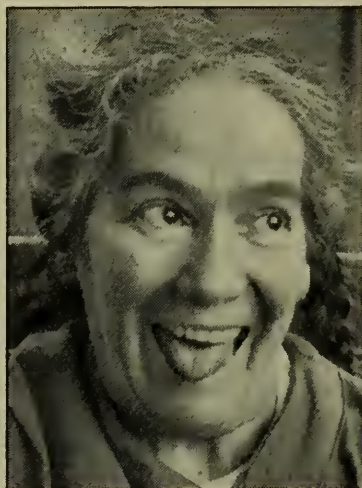


FIG. 1.

The patient is one of five sisters, of whom four are alive. She has seven children, of whom six are alive. Her mother died at the age of 50, cause unknown, and her father at 80, of some abdominal complaint. There is no history of any nervous, mental, or similar complaint in the family. She was born, and has lived, in the South of England.

On examination, patient is well nourished and of normal intelligence. She reads much and amuses herself in a normal way. The facial muscles are contracted so as to give rise to a spastic smile. The upper and lower muscles of the face are both affected. The smile is aggravated by observation and by performing such actions as those of showing her tongue, &c. (fig. 1). The spasm can be controlled and ceases during sleep, but the naso-labial folds are permanently very pronounced. The articulation is very imperfect as a rule, but at times she can speak

almost normally. The tongue is rather large and undergoes ceaseless rolling movements within the mouth. It appears to be too large for the mouth, and to prevent proper articulation by getting below the lower jaw. The jaw itself is normal. The right upper extremity is in a state of constant, fairly rhythmic tremor, of the intention type. There is considerable ataxy in this limb on, for example, trying to touch her nose with the finger. Writing is impossible, and has not been performed with the right hand for thirteen years, but she is able to do her hair, &c., fairly well (fig. 2). Gait slow and hesitating. No weakness in upper extremities, and ataxy only in the right. No weakness in the lower extremities, but both legs are at times slightly ataxic—e.g., in heel-knee test. There is some tendency to hypotonus. Optic disks and pupils

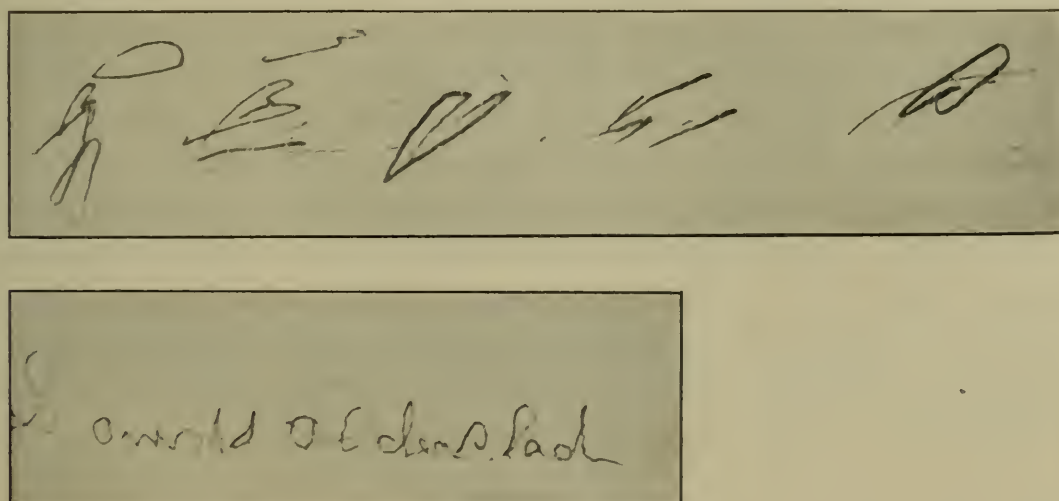


FIG. 2.

Specimens of handwriting with right hand (upper figure) and left hand (lower figure).

normal. Occasional slight nystagmus on looking to the right. The palate is normal and she swallows without difficulty. There is no atrophy of the tongue. With the exceptions of the facial spasm and the constant movements of the tongue the cranial nerves present no abnormality. Reflexes: Arm-jerks exaggerated, more so on the right side; knee-jerks exaggerated; ankle-jerks normal; plantars flexor; abdominals not elicited. The sphincters are normal. There is no abnormality in the sensory system. The heart and viscera are normal. Blood-pressure, 140 mm. Hg. Urine normal. There is no enlargement of the liver.

The condition is obviously due to some extra-pyramidal disease, and the lesion is probably situated in the red nucleus.

Case of Old-standing Brachial Birth Paralysis with Subluxation of the Shoulder-joint and Anterior Dislocation of the Head of the Radius.

By J. E. H. ROBERTS, F.R.C.S.

MALE patient, aged 17. At three days old the right arm was noticed to be paralysed. Now there is a subspinous dislocation of the head of the humerus and a forward dislocation of the head of the radius. The muscles of the shoulder and upper arm are well developed. The forearm flexors are fairly powerful but the extensors are weak. In the hand the finger-joints are flexed and the metacarpophalangeal joints hyperextended. The thumb is flexed across the palm. The lower part of the forearm and hand are blue and cold. The arm cannot be abducted from the side, although the deltoid has recovered, nor can it be externally rotated. Passive extension of the elbow is possible to the full extent, but flexion is limited beyond a right angle by the head of the radius. On attempting active movement the biceps, triceps, and forearm flexors all contract together, so that no movement occurs. Electrical reactions of the shoulder, arm and anterior forearm muscles are normal. Posterior forearm very weak, normal. Median intrinsics of hands weak, normal. Ulnar intrinsics, partial R.D.

DISCUSSION.

Mr. FAIRBANK said he was much interested in Mr. Roberts's case as he had given considerable attention to these cases during recent years. He had met with one other case of dislocation of the head of the radius associated with subluxation of the head of the humerus following birth palsy. In his case, a boy, there was not so much limitation of flexion as in the case shown. In Mr. Roberts's case he did not think operation upon the shoulder-joint was advisable, since the condition of the hand was so poor.

Mr. ROBERTS said that he had now seen the patient's mother and she stated that he was her thirteenth child. The previous twelve labours were normal, but in this case labour was prolonged and difficulty occurred with the shoulders, which were born some time after the head. Instruments were used without an anæsthetic and the child was born "black" and was revived with difficulty. There was no evidence that there was any central lesion. No sensory changes were present, the reflexes were not increased and no associated lesions could be found. The only explanation which he could offer was that

there had occurred a mixing up of the fibres in the brachial plexus. He would be glad of opinions as to the advisability of operating on the shoulder in the way Mr. Fairbank recommended or of excising the head of the radius, and as to the possibility of re-educating the patient to gain control of his muscles.

Case of Pulmonary Tuberculosis, commencing Gymnastic Treatment.

By F. SYLVAN, M.D.

G. G., MALE, aged 27. During several months he did not feel well, and in July, 1913, his lungs were declared to be affected. On September 1 he went to Downs Sanatorium and stayed till November 13. He then started work, but the next day he had a hæmorrhage and ceased work. A few days later slight hæmorrhage occurred again on two occasions. At the beginning of his stay in the sanatorium his temperature was frequently 100.2° F., but after six weeks it was normal. Coughs mostly in the morning; expectorates a fair amount. Slight dullness on percussion and crepitations over both apices. Vital capacity, 2,700 c.c.; inspiratory power, 28 mm. Hg.

Case of Multiple Carcinoma of Bone.

By HECTOR MACKENZIE, M.D.

R. W., MARRIED woman, aged 45. For nine years she has suffered from "kidney trouble." There has been blood in the urine from time to time, and there has been intermittent pain in the right loin. Her doctor, suspecting stone in the kidney, sent her to the Samaritan Hospital, where she was admitted under the care of Mr. Malcolm. Mr. Malcolm asked me to see her on account of swelling and stiffness of both shoulders, and she was transferred to my care at St. Thomas's Hospital on February 16, 1914. She began to suffer pain in the right shoulder in March, 1913. The pain gradually got worse and prevented movement in July, 1913. She is uncertain when the left shoulder became affected, but she thinks it was soon after the right. The right elbow also became painful and stiff. The shoulders gradually became swollen and the arms and hands became weak.

On examination both shoulders are very prominent in front. The posterior deltoid regions on both sides are swollen, tense and very tender.

No movement can be obtained. There is pulsation over the swelling, which is expansile in character. On the right side the swelling appears to be most pronounced over the upper end of the humerus. On the left side swelling is greatest posteriorly in the situation of the scapula. There is stiffness and tenderness at the right elbow-joint. There is much wasting of the muscles of right arm and forearm, and the only movements possible are those of pronation and supination and the hand movements. On the left side wasting is not so obvious and the elbow can be flexed and extended. A systolic murmur is audible over the swelling on both sides. Loss of flesh has not been observed by the patient until recently, due, she says, to hospital diet. Her face is of a yellowish tint, and there is a pink flush on her cheeks. The spleen is palpable below the costal margin, and the edge of the liver can be felt 2 in. below costal margin.

X-ray examination by Dr. A. Reid: The upper part of the right humerus is expanded into a large rounded tumour. On the left side a large tumour replaces a considerable part of the scapula, the humerus being unaffected. The lower end of the right humerus is also the seat of some nodules of growth. Nothing abnormal was to be seen in the kidney area.

The urine was tested for Bence Jones protein with negative results.

The blood: The erythrocytes numbered 4,281,250 per cubic millimetre, and the leucocytes 9,280. The hæmoglobin was 85 per cent. of normal, and the colour index was 1. The differential count of leucocytes was as follows: Polymorphonuclear neutrophiles, 46 per cent.; polymorphonuclear eosinophiles, 2·3 per cent.; small lymphocytes, 44·7 per cent.; large lymphocytes, 4·3 per cent.; large hyaline cells, 2·7.

The distribution of the bone tumours points to their being secondary deposits. The most likely seat of the primary disease is the right kidney. If the latter is the seat of growth it must have supervened on an old lesion, probably renal calculus.

DISCUSSION.

Dr. HECTOR MACKENZIE said that to the above account of the case he ought to add that an X-ray examination of the kidneys had also been made at the Samaritan Hospital and did not reveal the presence of any calculus. The suggestion had been made by Dr. Andrew Elliot that it might be a case of hypernephroma, and there were several points in favour of that view. According to Scudder, a bone tumour in a middle-aged or elderly

person should suggest a metastatic hypernephroma. A bone metastasis might be the first evidence of a hypernephroma. But the ordinary course of a hypernephroma was that it grew rapidly and attained a large size. In the present case one would have to assume that the renal hypernephroma had been present for at least nine years, and that it had not grown to such a size as to cause any palpable enlargement of the kidney. Another possibility was that the cause of the hæmaturia had been a papilloma of the renal pelvis which had subsequently become carcinomatous.

Mr. J. D. MALCOLM said the only facts he could add to Dr. Mackenzie's description of this case were that the patient's doctor informed him that at intervals of a few months she had free hæmorrhages *per urethram*, the blood being red with large clots, and during the bleedings there was much pain in the right kidney region, which was painless at other times. Cystoscopic examination showed a healthy bladder and ureteral orifices. The speaker inclined to the view that the presence in the right kidney of a papillary growth undergoing malignant degeneration would best explain the clinical history. He had very little experience of secondary malignant disease in bone, but he might mention one case which, possibly, had some bearing upon the interpretation of the one under discussion. On April 3, 1909, he opened a large abscess in the cæcal region of a man who had suffered, during eight years, attacks of pain, becoming more frequent, in the right side, which were accompanied by vomiting and constipation, and which previously had been cured by purgatives. All the fæces came through the abscess, and on June 3, 1909, an ileo-sigmoidostomy was performed which gave complete relief, except that a sinus and a large mass remained. On October 19 the cæcum was removed and within it a growth blocking the ileo-cæcal valve. Mr. Shattock examined the specimen, which is preserved in the Royal College of Surgeons, and suggested that the growth had begun as a papilloma which afterwards became carcinomatous. The case was published and figured in the *Lancet* of October 15, 1910, when the patient was so well that he had been able to walk for pleasure from Brighton to Mortlake, approximately 50 miles, at the age of 65, in one day. He remained well until the autumn of 1912, nearly three and a half years after his tumour was removed. A tumour then developed in his right lower jaw, and he hesitated about its treatment so long that its removal became impossible and he died on June 5, 1913. There was never, at any time, any sign of abdominal or intestinal complication. In this case, as in that recorded above by Dr. Mackenzie, an opportunity for operating was not offered sufficiently early.

Dr. HECTOR MACKENZIE, in reply, said that the cases of hypernephroma mentioned by Mr. Kellock were of great clinical interest and showed that these tumours might sometimes be of slow growth and give rise to symptoms suggestive of calculus. The lesson to be learnt was that when there was a history of chronic pain and hæmaturia the kidney should be explored for hypernephroma as well as for calculus. When metastases had occurred, as in this case, the time for operation had, unfortunately, gone by.

Case of Malignant Disease of the Male Breast.

By H. W. CARSON, F.R.C.S.

THE patient, a man, aged 65, had had a growth in the right breast for between seven and eight years, and believed that it followed an injury ten years ago. His work did not cause traumatism to the breast. The condition was one of slow-growing scirrhus, forming a tumour centrally placed in the tissue of the right mammary gland, implicating the skin and adherent to the sheath of the pectoralis major. Enlarged glands could be felt in the axilla and posterior triangle of the neck, and there was a doubtful nodule in the liver.

The case was shown as an example of a somewhat rare condition, but the exhibitor feared it was inoperable.

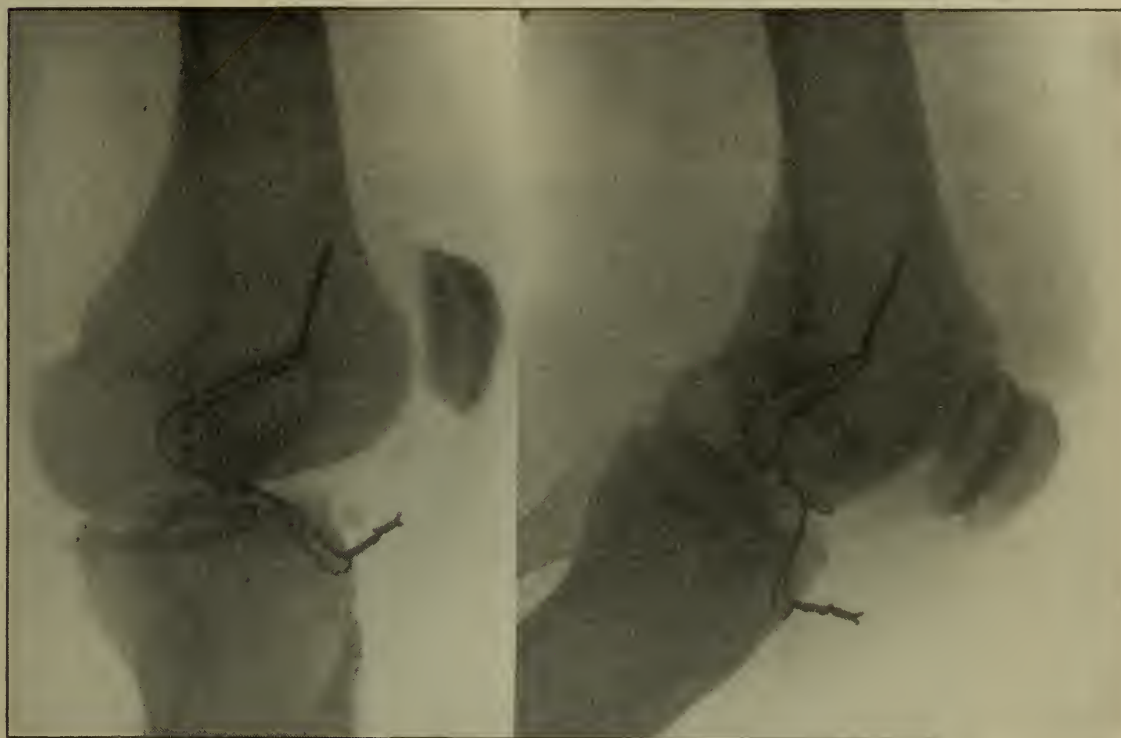
Notes of a Case illustrative of an Artificial Anterior Crucial Ligament, demonstrating the Action of that Ligament.

By E. M. CORNER, M.C.

THE patient is a healthy man, aged 29. Previous to this he had had nothing the matter with the knee-joint. About seven years ago whilst playing football he fell down, twisting his knee; very shortly after the accident the joint became very swollen. Subsequently the joint became quite well and strong, the patient playing football again. For a second time he twisted his knee at football. This time it never got well and strong again; in consequence of which he had his internal semilunar cartilage excised and was later invalided out of the Service. At the present time he complains of pain and weakness in the knee-joint, which suddenly gives, letting him down. The joint never locks, but is too loose. On examination the joint was found to move freely, laterally when extended; but flexion was limited.

Operation: The patella was divided longitudinally, the rectus femoris and the ligamentum patellæ being split in the direction of their fibres. The anterior crucial ligament was found to be completely

ruptured. A femoral loop of silver wire was passed through the external condyle into the knee-joint and made to interlace with a similar tibial loop through the tibia. This formed a new anterior crucial ligament. The joint was then closed.



Skiagraphs of the bones of the knee in extension and flexion, showing the presence and action of an artificial anterior crucial ligament made of silver wire.

The patient left the hospital within three weeks, being able to bend his knee to a right angle and expressing himself as much pleased with the result of the operation.

The two skiagraphs show the new (wire) ligament in flexion and extension of the knee.

Case of Fractured Spine of the Tibia.

By E. M. CORNER, M.C., and R. M. DE MOWBRAY.

THE patient, a young man, in the early part of last December injured his leg while playing football. A heavy man fell on the outer side of the knee of the extended limb. Shortly after the accident the



Skiagram of the bones of the knee, showing the separation by fracture of both tubercles of the spine of the tibia.

knee became swollen and there was considerable extra-articular swelling of the joint. Abduction of the knee was easy and the tibia could be separated by $\frac{1}{2}$ in. from the femur. Flexion of the joint was impossible. On examination all movements of the joint were fair, but flexion was much restricted and painful. The signs and symptoms were such that two intelligent and responsible surgeons thought that there could be no serious injury in the joint. The skiagram shows separation of both tubercles of the spine of the tibia.

Case of Extradural Hæmorrhage causing Slight Aphasia from Pressure over Broca's Convolution.

By V. ZACHARY COPE, F.R.C.S.

N. C., MALE, aged 29, was struck over the left temple on August 4, 1913. He was unconscious for a time and had not regained full consciousness when admitted to the Bolingbroke Hospital under my care on August 5. On admission his pulse was 50, and respiration 20; he was drowsy but could be roused. The knee-jerks were slightly exaggerated and the pupils were equal and reacted normally. There was slight swelling and bruising over the site of injury. In the absence of localizing symptoms no operation was considered advisable. For some days the condition improved, so that he could answer questions sensibly, but it was noticeable that after giving a sensible answer his speech would tail off into a jumble of disconnected nonsense. Nine days after admission his right pupil became larger than the left and early optic neuritis was found. The pulse still remained 50 to the minute. Operation was undertaken on August 15. The skull was trephined over the anterior branch of the left middle meningeal artery. An ounce or more of old blood-clot was found outside the dura, extending down to the skull base, and two depressed pieces of bone were removed. The dura was not opened. No drainage. Recovery was very rapid after operation. Speech was soon quite perfect and pulse normal. He was discharged from hospital just over a fortnight after operation.

Case of Deformity of the Long Bones (Osteogenesis Imperfecta).

By T. H. KELLOCK, F.R.C.S.

THE patient is a boy, aged 4, who was sent to hospital on account of lameness and bending of the right thigh. He is one of twins, there being nine other children, all healthy, except a sister who has been in splints for knock-knee. The mother and father are both alive and healthy. The children were born at full term, they were breast-fed for

three months, subsequently artificially. The twin sister is quite well and has no deformity of bones. For three years the child seemed quite well and walked well. A year ago he fell down stairs and "bent" his right leg above the knee; pain and swelling of the part resulted, but he was able to walk for a few days after the accident; three months



FIG. 1.

Deformity of the long bones. Skiagram of femora.

afterwards it was put on a splint, which has been used ever since, that is, for about seven months.

The child now has the appearance of suffering from rickety deformities of the bones, the skull is large and the frontal eminences

prominent; the chest is flattened from side to side and there is well-marked "rickety rosary." Both femora show antero-posterior curvatures at the junction of middle and lower thirds, the right especially. The tibiae are flattened from side to side and curved forwards towards the lower ends. Thickening can be seen and felt at most of the epiphyseal junctions.



FIG. 2.

Skiagram of bones of the legs.

Skiagrams show attenuation of the long bones and bones of the tarsus, there is very little compact tissue, and the medullary tissue is almost "spider-web" like in appearance. There is no obvious fracture at the seat of the bending in the right femur.

The child's general condition is good and he has good teeth.

DISCUSSION.

Mr. H. A. T. FAIRBANK said that at the present time he had a case in hospital, a girl, aged 18, with an affection of the bones indistinguishable from rickets. He thought the skiagrams of the case shown were characteristic of rickets and not of osteogenesis imperfecta, in which fractures were the special feature. He had had his own case under observation for five to six years since double osteotomy was done for genu valgum. The patient returned because the bones were bending again. In spite of cure of oral sepsis and other treatment the condition remained the same. She was now in hospital for mal-union of a fracture of the femur sustained while in a convalescent home six months previously.

Mr. CORNER did not think that the differences of opinion expressed about these cases of fibrocystic disease were really as great as they seemed. Mankind was subject to diseases whose clinical and pathological causes were determined by the stage of development of the affected individual. Thus we recognized diseases of babies, children, young adults, middle age, and advanced years. Similarly was it with bone. All diseases affecting the development of bone were, until recently, called "rickets"; now we recognized other forms of imperfect development, of which Mr. Kellock's case was an example. Some seven or eight years ago he (Mr. Corner) showed a somewhat similar case at the Clinical Society. The skiagrams of the bones showed clear areas in them. A piece of tissue was removed which showed that the clear areas were not cysts but cartilage with irregular strands of ossification through it. As the years passed by these clear spaces became darker and darker as more bone was laid down in them. Then this girl broke her leg, which united slowly, the union appearing to be assisted by the administration of calcium salts. But the fracture could not be obviously attributed to the osteogenesis imperfecta, as it occurred at a place in the tibia which was not apparently affected. Mr. Corner regarded most of these cases as examples of the result of some influence or influences disturbing the orderly development of the bone, making it disorderly in quantity and quality. As to what these influences were we could not say much just now. There seemed only ample evidence for the existence of factors of intoxication as seen in syphilis, cretins, and so forth.

Case of Aneurysm of the Ascending Aorta.

By R. O. MOON, M.D.

D. S., AGED 37, widow, no children. Family history unimportant. No history of any rheumatic affection. Miscarriage at the age of 25. About seven years ago she realized that her heart was diseased in some way; she suffered from palpitation, shortness of breath, choking sensations and occasional pains in the left mid-axillary line. Rather deaf the last two to three years. About ten months ago she noticed a swelling in the upper part of the chest with throbbing sensations and pain over it. Physical signs: There is a bulging of the three upper right ribs at their sternal ends extending for 9 cm. from the mid-line. Over the swelling there is a well-marked systolic thrill and harsh systolic and diastolic murmurs. The apex beat is diffuse in the seventh space and displaced outwards. To-and-fro murmurs are heard all over the præcordial area. Pulses equal, markedly collapsing, rate 100; blood-pressure 172. Pupils equal, no dysphagia or tracheal tugging. Wassermann reaction is positive. The size of the aneurysm could be seen in the skiagram shown.

Dr. ESSEX WYNTER, referring to the employment of salvarsan in aneurysm and other lesions of vital organs, which had been the subject of a special warning by Professor Ehrlich, mentioned two cases in his own experience—a man with tabes dorsalis, who had been immediately benefited, but who died suddenly and unaccountably two months later, and a man with dilated aorta, who developed serious laryngeal spasm through involvement of the recurrent laryngeal nerve.

Specimen from Case of Myxo-chondroma of the Thigh.

By P. P. COLE, F.R.C.S.

THE sections exhibited concern a case of tumour of the thigh, which was shown at the meeting of the Section on October 10, 1913.¹ The tumour developed after a fracture of the femur, but the history suggests that an endosteal tumour was present before fracture occurred. It was

¹ See *Proceedings*, p. 10.

suggested that radium might be tried with advantage. Accordingly, 200 mg. were embedded in the tumour, and allowed to remain for twenty-four hours. The constitutional effect was considerable, and the patient's general condition was seriously impaired. Radium was applied externally during the course of two months. A sinus persisted at the site of introduction, and the tumour became slowly but steadily larger. The patient was reluctant to lose his leg, but eventually consented. Amputation through the hip-joint was performed on January 28, 1914. Spinal anæsthesia was used to guard against shock, and because the patient was the subject of marked aortic regurgitation. The type of operation was an anterior racquet, only just sufficient of the thigh being uninvolved to obtain flaps. There was no shock, and recovery has been uninterrupted.

Sections were shown of the tumour itself, and of an enlarged gland removed from the inguinal region.

Notes of a Case of Traumatic Sensory Aphasia, treated successfully by Trephining and Removal of Clot.

By V. ZACHARY COPE, F.R.C.S.

E. B., AGED 14, was brought to the Bolingbroke Hospital about eight o'clock on the evening of August 14, 1913, with the history that she had fallen down a flight of six steps and struck the back part and left side of her head against the step or ground. The accident had occurred three hours previously; during the intervening time she had been semiconscious and had vomited frequently. Up to the time of the accident she had been a lively and intelligent girl in full possession of her faculties.

When admitted the patient's temperature was normal, pulse 76, respirations 16 per minute. She lay with eyes closed, but when approached opened them and said, "Don't hurt me, daddy," and repeated the word "daddy" frequently during the initial examination. She had no recollection of the accident, and with difficulty recalled her actions prior to the injury. At the same time she continually relapsed into a more drowsy condition; her eyeballs kept rolling upwards. There was an abrasion and a very small scalp wound behind the left ear. There were no signs of fracture of the skull base, and no paralysis of cranial

or peripheral nerves. The pupils were of normal size and reacted to light; the knee-jerks were elicited and the plantar reflex was normal. Her condition did not improve; she remained in an irritable state, curled up on her right side in bed, and resented any interference. Vomiting occurred several times. She spoke no word spontaneously, but apparently heard what was said to her. At first her condition was taken to be that of simple concussion and cerebral irritation, and I was not asked to see her. Gradually, however, her pulse became slower until it was about 50 per minute, whilst her mental condition remained anomalous, in that she seemed fully conscious yet did not utter a word.

On August 19, when I saw her first, the condition was much as described above. There was no paralysis, but I could not elicit the knee-jerks; there was some photophobia; the pupils were equal, slightly dilated, and reacted to light normally. Ophthalmoscopic examination showed congestion of the retinal vessels and blurring of the edges of the disks. On the next day (August 20) the aphasic condition was more fully investigated by my house surgeon (Mr. O. R. L. Wilson), to whom I am indebted for these notes. The only word she could be got to utter spontaneously was the nick-name of her sister, and this name, "Doodles," she repeated throughout the examination. She gave plenty of indication that she understood words spoken to her, but could not answer any question intelligibly, a jumbled mutter of unintelligible sounds being all that she could attempt. She was unable to repeat words spoken to her. She did not understand written questions or commands, though it was clear she saw them. She was able to write spontaneously, but her writing was not intelligible. She copied capital letters correctly, but came hopelessly to grief when attempting to copy ordinary handwriting. She was unable to write from dictation, nor could she name objects seen. Reading aloud from printed or written matter was not in her power, and she was unable even to pick out objects of which the name was given to her by speaking. She readily understood pantomimic gestures, and imitated them.

From the above examination it was evident that there was some serious lesion in the higher centres for understanding both printed and spoken words, but especially affecting the visual higher centres.

On August 21 operation was undertaken. A horseshoe-shaped flap was made with its base above the left ear. The trephine was placed so that the centre pin was 2 in., or a little more, above the external auditory meatus. No clot was found outside the dura, which was tense, bulging, and non-pulsatile. When the dura was incised a small amount

of dark blood was found underneath. By carefully searching in every direction under the dura by means of a flat metal instrument a considerable amount of old black blood-clot was discovered in a direction towards the occipital lobe. This clot escaped under considerable tension—it almost leapt out—and altogether several drachms came away. Some more bone was removed in a backward direction and the spaces between the bone and dura and the brain and dura were carefully searched, but no more clot was found. The cerebral cortex was also explored by needle and knife, but no subcortical hæmorrhage was found. The dura was sewn up with thread and the skin-flap replaced and sutured with silkworm gut without drainage. The pulse at the end of the operation was 100; at the beginning it had been 50 to the minute.

Recovery of speech after the operation was exceedingly quick. The next day the patient asked for some dinner, and in general showed a marvellous improvement. Within a week practically all her disabilities were removed, and instead of the stolid, non-comprehending countenance was the intelligent, mobile face, readily smiling and appreciating every remark made to her.

Clinical Section.

May 8, 1914.

Mr. CHARTERS J. SYMONDS, President of the Section, in the Chair.

Spleno-myelogenic Leukæmia.

By CLIVE RIVIERE, M.D.

MALE, aged 12; admitted to City of London Chest Hospital on December 6, 1913, with history of cough, breathlessness, pain in right shoulder, and general weakness of one year's duration. He then showed good nutrition with somewhat plethoric aspect, spleen to umbilicus, liver 1 in. below costal margin. Signs of enlarged thoracic glands, mainly consisting of increase of oval interspinous dullness on right side and impairment at lung apex. A skiagram confirmed this. Urine contained much albumin.

BLOOD COUNT (DECEMBER 9).

Red cells	...	...	...	...	2,920,000
Leucocytes	...	...	...	...	167,000
Hæmoglobin	...	...	...	...	55 per cent.
Colour index	...	..	...	...	0·9
Differential count :—					
Polymorphonuclear neutrophiles	...	...	...	...	43·0 per cent.
„ basophiles	...	...	...	...	5·0 „
„ eosinophiles	...	...	...	...	4·0 „
Lymphocytes, large	...	...	...	...	1·5 „
„ small	...	...	...	...	2·5 „
Myelocytes, neutrophiles	...	...	...	...	42·5 „
„ eosinophiles	...	...	...	...	1·5 „

December 13. Put on liq. arsenicalis 3 minims, rising to 4 minims, and on December 30 leucocytes had fallen to 137,000 per cubic millimetre.

On January 9, 1914, transferred to East London Children's Hospital so that X-ray treatment could be tried. After the first two doses a hard tube and aluminium filter were used.

January 14.	Leucocytes	...	328,000	Between January 14 and February 28 six X-ray doses of $\frac{1}{2}$ B Sabouraud applied to the spleen.
" 16.	"	...	279,000	
" 21.	"	...	256,600	
February 5.	"	...	362,200	
(Myelocytes 56 per cent.)				
February 13.	Leucocytes	...	372,000	Between February 6 and February 27 X-rays in similar doses applied twice weekly to right and left leg alternately.
" 23.	"	...	310,000	
March 3.	"	...	334,800	
(A few nucleated reds seen for first time)				
March 16.	Leucocytes	...	349,200	Between March 3 and April 20 benzol given in doses of 2 minims rising to 6 minims in petroleum emulsion
April 20.	"	...	400,800	
April 26.	Leucocytes	...	425,000	On April 20 put back on liq. arsenicalis 3 minims, rising by April 30 to 6 minims.

The red cells on January 14 were 4,480,000 and the hæmoglobin 72 per cent., and they have remained much the same since. During the time the boy has been under observation he has felt well, has gained 6 lb. in weight, and his temperature has kept within normal limits. The pulse is accelerated, about 116. The liver has remained unaltered, but the spleen has increased in size both downwards and forwards. The area of lung impairment, indicative of enlarged chest glands, has also increased, and now extends between the first and ninth dorsal spines on the right side. The last full differential leucocyte count obtained (April 20) is as follows:—

Polymorphonuclear neutrophiles	...	...	28.5 per cent.
" eosinophiles	...	...	2.0 "
Lymphocytes, large ...	...	...	3.5 "
" small...	...	...	3.5 "
Transitionals	...	...	12.5 "
Myelocytes, neutrophiles	...	...	39.0 "
" eosinophiles	...	...	6.0 "
Two megaloblasts and one normoblast seen among 200 cells counted.			

Note.—A leucocyte count made subsequently to the meeting showed that after three weeks of arsenic treatment, begun April 20, the leucocytes had fallen below 100,000 per cubic centimetre.

DISCUSSION.

Dr. RIVIERE thought there were two points about the case worthy of comment—firstly, the absence at first, and still the scarcity, of nucleated red cells, and secondly the presence of enlarged thoracic glands. These latter he regarded as coincidental and probably tuberculous. The case was exhibited to demonstrate the apparent failure of benzol and X-ray treatment in certain cases to reduce the number of leucocytes.

Dr. H. D. ROLLESTON referred to his case of chronic lymphocytic leukæmia in which benzol had had a very beneficial effect.¹ In connexion with the question why one case of leukæmia reacted to benzol while another did not, he suggested that possibly benzol was not absorbed from the alimentary canal of some patients. Perhaps examination of the urine for ethereal sulphates might show whether or not absorption of benzol was taking place.

Dr. F. PARKES WEBER remarked that the case of chronic myelocytic leukæmia in an adult man, shown by him before the Section at the December meeting,² failed to react properly to benzol, and even Röntgen rays did the patient no permanent good. When he left the hospital on March 13, 1914, after another trial of benzol-therapy, his white cells numbered 52,800 per cubic millimetre of blood. They had numbered 71,000 on February 16, when Röntgen therapy was discontinued and a second trial of benzol commenced. The benzol was discontinued on March 9 as the patient disliked it and had slight diarrhœa. By April 6 the white cell count had risen to 312,000 and there was increasing weakness with cachexia. On April 15 the patient died in his own home. Two questions arose: (a) Was deficient effect of benzol-therapy a sign of special grave prognostic significance in cases of chronic leukæmia? (b) Did benzol exercise a more decided (leucotoxic?) effect in cases of chronic lymphocytic leukæmia than in cases of chronic myelocytic leukæmia?

Splenectomy for Splenomegalic Cirrhosis with Ascites.

By SIDNEY BOYD, M.S.

R. M., AGED 23, came under observation on November 5, 1913, for ascites. In 1908 patient had been in hospital, but not under my care, for ascites. The notes of the case state that the spleen was somewhat enlarged. Paracentesis abdominis was performed several times, but the fluid quickly re-accumulated. Laparotomy was then performed, and the condition was thought to be due to tuberculous

¹ *Proc. Roy. Soc. Med.*, 1914, vii (Sect. for the Study of Dis. in Child.), p. 129.

² *Proceedings*, p. 41.

peritonitis. There were "some very suspicious caseous masses at the junction of the Fallopian tubes with the uterus, and partly on the broad ligaments. No definite tubercles could be seen elsewhere. The peritoneum looked very red, was much congested, and bled very freely." The abdomen was drained with a rubber tube for twenty-four hours, a large quantity of fluid escaping. She made a good recovery from this operation, and continued in good health until October, 1913, when she noticed that the abdomen was again becoming distended. Upon examination on November 5, 1913, patient was found to be a well-nourished young woman, neither anæmic nor icteric, and with no signs of disease in the chest. The abdomen was greatly distended, the girth at umbilicus being 36 in. No dilated veins visible on the abdominal wall. The scar of the previous operation had stretched somewhat, and bulged forwards. The distension was obviously due to ascites, and in the upper part of the abdomen an enlarged spleen could be felt. The liver was not palpable. There was no history of alcohol.

On November 13 laparatomy was performed, the old scar being excised, and a large quantity of straw-coloured fluid escaped. There were no signs of tuberculosis either on the parietal or visceral peritoneum, but a few adhesions were present between the coils of intestine. Except for some adhesions around the pelvic organs, the latter appeared normal. The liver felt hard and irregular on the surface, and smaller than normal. The spleen was considerably enlarged, and its convex surface was free from adhesions. The parietal peritoneum was somewhat thickened. The incision was closed and healed well in seven days.

On November 20 the blood was examined by Dr. A. E. Stansfeld, who reported as follows:—

Red cells	...	...	...	5,700,000 per c.mm.
Hæmoglobin	...	...	...	90 per cent.
Colour index	...	...	...	0·8.
Leucocytes	...	...	...	9,000 per c.mm.
Differential count:—				
Polymorphonuclears	...	...	...	56·0 per cent.
Lymphocytes	...	...	...	39·5 ,,
Large mononuclears	...	...	...	0·5 ,,
Eosinophiles	...	...	...	3·5 ,,
Basophiles	...	...	...	0·5 ,,

The red cells are natural in appearance. Wassermann reaction negative. The ascites rapidly recurred after the operation, and on December 2 the girth was 38 in. Paracentesis was performed and 15 pints of fluid drawn off. This was repeated on December 17 and 11 pints drawn off.

On December 18 splenectomy was performed through a vertical incision at the outer edge of the left rectus. Anæsthesia by "anoci-association" was employed. It was not possible to deliver the spleen through the wound on account of a broad band of adhesion from the posterior border to the posterior abdominal wall. The pedicle was therefore first tied off in sections and divided, and the adhesions posteriorly then dealt with. The branches of the splenic artery and vein were very large, but very little blood was lost. The liver was inspected and found to be in an extremely cirrhotic state, being not more than two-thirds the normal size, very hard and granular on the surface. There was practically no omentum present, only a few tags, or I should have performed omentopexy. The incision was closed in the usual way.

The patient recovered well from the operation and her convalescence was smooth. The ascitic fluid collected again, but more slowly than before the operation. Three and a half weeks after the operation the girth was 37 in. and paracentesis was then performed, $11\frac{1}{2}$ pints being drawn off, reducing the girth to $29\frac{1}{2}$ in. Eleven days later the girth had increased to 33 in. from re-accumulation of fluid, but after this it gradually decreased and the fluid disappeared. It has not since re-collected, and the patient's general condition is good.

On March 31, 1914, the blood was again examined by Dr. A. E. Stansfeld:—

Red cells	5,000,000 per c.mm.
Hæmoglobin	98 per cent.
Colour index	0.98.
Leucocytes	15,600 per c.mm.
Differential count:—	
Polymorphonuclears	38.5 per cent.
Lymphocytes	57.0 ,,
Large mononuclears	0.5 ,,
Eosinophiles	3.0 ,,
Basophiles	1.0 ,,

The red cells are natural in size, shape, and staining reactions.

Pathological Report by Dr. A. G. Gibson.—Naked eye: The spleen preserves its normal shape, but is enlarged to at least thrice its normal size (9 in. by $4\frac{1}{2}$ in. by 2 in.). Its capsule is everywhere thickened, more so in the lower parts than elsewhere. There are a few tubercular thickenings upon it near the upper pole, and the remains of some fibrous adhesions can be seen. On section, the surface is firm and dark red, with numerous trabeculæ, many of which are thickened. The

pulp is firm, cannot be expressed, and the Malpighian bodies are not numerous, though evident. In every cross-section through the length of the organ are to be seen one or two small points and lines made up of yellow pigment, some of them branched. Microscopically, the organ is highly cellular, with well-marked Malpighian bodies and trabeculæ, some of which are very much fibrosed. Many of the larger trabeculæ are infiltrated with cells, chiefly lymphocytes, and in some there are hæmorrhages. A section across one of the pigmented spots previously mentioned, stained by Wheal and Chown's method, shows thick masses and threads in relation to a trabecula. Closer examination under the one-twelfth objective demonstrates it to consist of masses of black fibres of various thicknesses; some of the smaller fibres show transverse, clear bands indicating a septate structure, and in relation to these smaller threads are numerous structures, the shape of a thick bacillus, staining the same as the long fibres. Bacteriological examination: Numerous pigmented spots were excised under strict aseptic precautions and planted on various media. In glucose broth these grew very feebly, after eighteen days' incubation, a thick, Gram-negative, non-motile bacillus appeared, which could not be continued in sub-culture. The remainder of the culture tubes remained sterile.

Microscopic slide of the spleen shown.

Remarks.—This case is of interest both from the point of view of diagnosis and also from the effect of removal of the spleen. The case is obviously not one of Banti's disease (regarding Banti's disease as the terminal stage of splenic anæmia). There has been no anæmia, no leucopenia, no gastro-intestinal hæmorrhage. The spleen is known to have been enlarged in 1908, when laparotomy was performed for chronic peritonitis, probably of a tuberculous nature. Is it possible that the whole condition is due to tuberculosis—the splenomegaly, the hepatic cirrhosis and the ascites? (Various French authors have raised the question of tuberculous hepatic cirrhosis.) We have also to consider the organism grown from the spleen by Dr. Gibson. The first laparotomy cured the ascites for five years. The second laparotomy had no effect on the ascites, which rapidly recurred. Removal of the spleen certainly had a direct effect upon it. The ascites could not have been due solely to peri-splenitis, as the fluid re-accumulated at first after removal of the spleen and the abdomen had to be tapped. Nor will simple mechanical relief to the portal circulation, which splenectomy would entail, account for the result, for the same reason. Removal of

the spleen is not likely to influence the hepatic cirrhosis so favourably in a few weeks as to cause the ascites to disappear. On the other hand, if the spleen be regarded as a primary seat of infection with the organism grown from it, secondarily to which a chronic peritonitis developed and also hepatic cirrhosis, we have an explanation which will satisfy all the conditions. This is the view which I am inclined to take, and to consider the illness from which the patient suffered six years ago as an independent one, as far as the ascites is concerned. Time alone will tell whether the removal of the spleen has arrested the progress of the cirrhosis, but from the point of view of relieving the ascites the operation has already justified itself.

Case of Splenomegaly with Gastro-intestinal Hæmorrhages.¹

By JAMES GALLOWAY, M.D.

A FEW days after the patient was shown at the February meeting the abdomen was tapped and a large quantity of ascitic fluid removed. After further careful consideration it was decided to remove the spleen, and on the day before the operation the abdomen was again tapped, about 30 pints of clear ascitic fluid being withdrawn.

The operation of splenectomy was performed on Tuesday, March 10. The spleen was removed through an incision corresponding approximately to the outer edge of the left rectus muscle. The spleen itself lay free, with the exception of its natural attachments and a few adhesions at the posterior surface. On account of its position in the abdominal cavity there was a little difficulty in finding and isolating the pedicle. The vessels were ligatured, and, just as the spleen was being removed, the cavity filled up rapidly with venous blood, perhaps from the splenic vein. About 5 or 6 oz. of blood appeared to be lost in this way, but the bleeding was rapidly stopped, the cavity cleared out, and the splenic vein was seen and once more carefully ligatured. The operation in its later stages had to be performed as rapidly as possible on account of the exhausted condition of the patient.

The immediate result of the operation seemed to be satisfactory. The patient recovered in a remarkable manner from the shock, and the next day the number of red blood cells was found to be 2,300,000. The

¹ Continuation of the case shown at the meeting on Friday, February 13.

temperature rose rapidly after the operation, but again fell, till on March 14 it reached the level of 100° F. Examinations of the blood were repeatedly made, the general result being that the number of red blood cells seemed diminished; a considerable rise in the number of leucocytes was noticeable, the maximum being 23,100 per cubic millimetre on March 23. The most noticeable feature was the steady and remarkable increase in the number of nucleated red blood cells. On March 24 there were 12,740 leucocytes per cubic millimetre, the number of nucleated reds being 11,800. After the first rise of temperature and the fall to nearly normal the temperature again began to rise, reaching 103° F. on March 19, again falling to nearly normal, but showing slight elevations to about 100° F. till within a day of the fatal termination.

Soon after the operation it was noted that quantities of ascitic fluid began to flow out through the wound from the abdominal cavity. Gradually the greater part of the wound was opened out on account of the escape of fluid and quantities of ascitic fluid passed into the dressings. In spite of this condition the patient showed remarkable powers of resistance, and it was not till ten days after the operation that he showed definite signs of exhaustion. A certain amount of infection of the edges of the wound was noticeable, but there were no signs of general peritonitis at any time. He died in an exhausted condition on March 25.

Post-mortem examination showed an infected condition of the external wound and, to a slight extent, of the cavity from which the spleen had been removed in the immediate neighbourhood of the wound, but there were no indications of generalized peritoneal infection. The cut end of the splenic artery and vein at the point of ligature seemed to be well healed. The splenic artery was extraordinarily tortuous, and filled with blood-clot up to its junction with the aorta. The splenic vein seemed large, and in many places contained blood-clot. Part of this thrombosis was probably post-operative, but further examination will be necessary to clear up the point as to whether old thrombosis or disease of the splenic vein exists. In addition to the thrombosis of the splenic vein, a certain degree of thrombosis of the portal vein and its other branches, such as the superior mesenteric and the coronary, was noticeable. The remains of the vasa brevia were enlarged, and the veins of the mucous membrane of the lower portion of the œsophagus and the œsophageal end of the stomach were greatly enlarged and congested. The liver was not enlarged, was exceedingly pallid, as were all the organs of the body, and showed no evidence of

cirrhosis, either of a fine or coarse type. A little puckering of the right margin of the liver was noticeable, but is probably not of cirrhotic nature. Microscopic examination gave no evidence of increase of fibrous tissue of the cirrhotic type.

The spleen weighed 33 oz., was firm, of dark purple colour, and on microscopic examination gave evidence of a considerable degree of fibrosis and other changes which have been described in this condition.

It is hoped that a full account of this case will be given later.

Dr. PARKES WEBER said there were many points of interest for discussion, but he would only remark on the blood condition in Dr. Galloway's case, which followed the splenectomy. Even in a normal individual, when the spleen was removed on account of traumatic rupture, the erythrocytes increased in number, suggesting that a normal hæmolytic action of the spleen had been removed by the splenectomy. But in Dr. Galloway's case the removal of the spleen was followed by a great, gradual influx into the circulatory blood of newly formed nucleated red cells, as if the spleen had been previously exerting an inhibitory action on the hæmopoietic function of the bone-marrow. Similarly, Dr. W. Hunter had just stated that in his experiments on animals a red transformation of the bone-marrow followed removal of the spleen.

Three Members of One Family suffering from Myotonia Hypertrophica—the Hypertrophic Form of Thomsen's Disease.

By ARTHUR F. HERTZ, M.D.

FAMILY HISTORY: The father and mother are stated to be normal. There have been eight children:—

- (1) The eldest brother, Allan T., aged 25, is shown this evening.
- (2) The second member of the family, aged 20, is perfectly well and is now serving in the Royal Field Artillery in India.
- (3) A male, aged 19, is normal and is now a second mate at sea.
- (4) Elsie T., aged 18, is shown this evening.
- (5) A male, aged 18, twin of Elsie T., was drowned at sea a year ago. He had always had some difficulty in executing movements and was generally regarded as being "very slow," but he was able to follow the occupation of a sailor. His myotonic condition doubtless contributed to his death when he fell overboard.
- (6) A female, aged 15, is normal.

- (7) The seventh is the boy, Albert T., aged 13, shown this evening.
(8) The youngest, a female, is said to be perfectly normal.
(The photographs were taken by Dr. W. Johnson.)

Case I.—Allan T., aged 25, has had increasing difficulty in performing all movement since the age of 8. He is now an inmate of a workhouse, where he looks after two lunatics. His muscular power is about normal, but all movements are extremely slow. There is universal hypertrophy of his muscles, so that he has a truly herculean appearance (figs. 1,

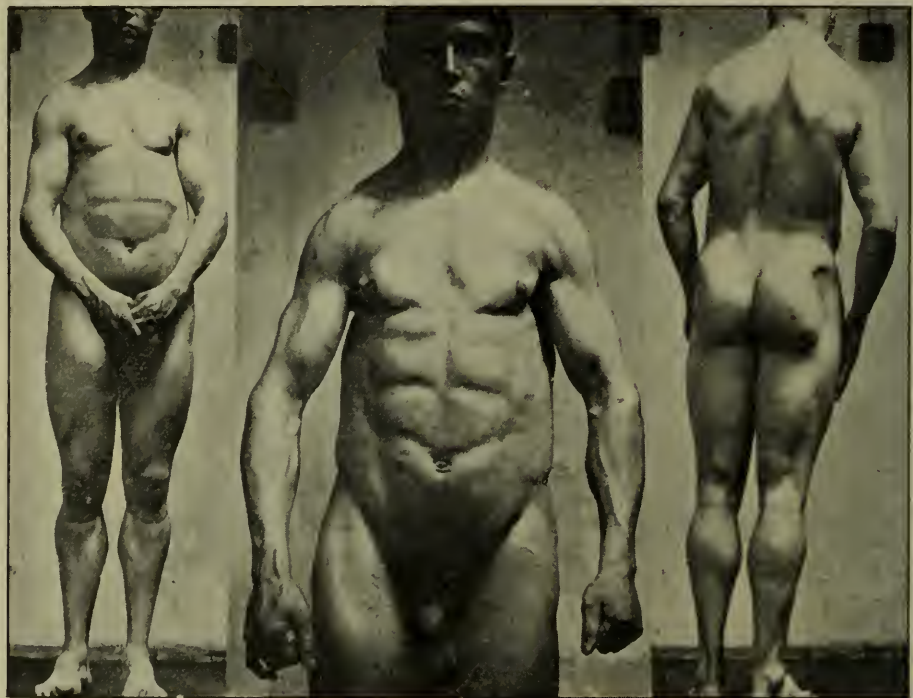


FIG. 1.

FIG. 2.

FIG. 3.

Fig. 1.—Allan T., showing enormous muscular development.

Fig. 2.—Allan T., showing hypertrophy of trunk, arm and neck muscles.

Fig. 3.—Allan T., showing generalized hypertrophy, and the ridge formed by contracted glutei on the right side.

2 and 3). His temporal, masseter and mylo-hyoid muscles, and all the muscles of his neck are hypertrophied, in addition to those of his limbs and trunk. All his muscles show a well-marked myotonic action (normal contraction with very slow relaxation) on voluntary contraction (figs. 4 and 5) and when mechanically stimulated by percussing them with a finger.

Case II.—Elsie T., aged 18, is a domestic servant. She says that ever since she can remember she has not been as active as her younger sister. She could never run upstairs quickly, and when doing exercises at school her teacher could never get her to open and close her hands as quickly as the other children. Her condition has become worse during the last few months. Her mistress has noticed that if there is a ring at the bell, she rises quickly from her chair, but is unable to move a step forward for several seconds. There is similar difficulty with the arms when she is doing her work about the house. The muscles are very well developed, especially those of the arms. The muscular

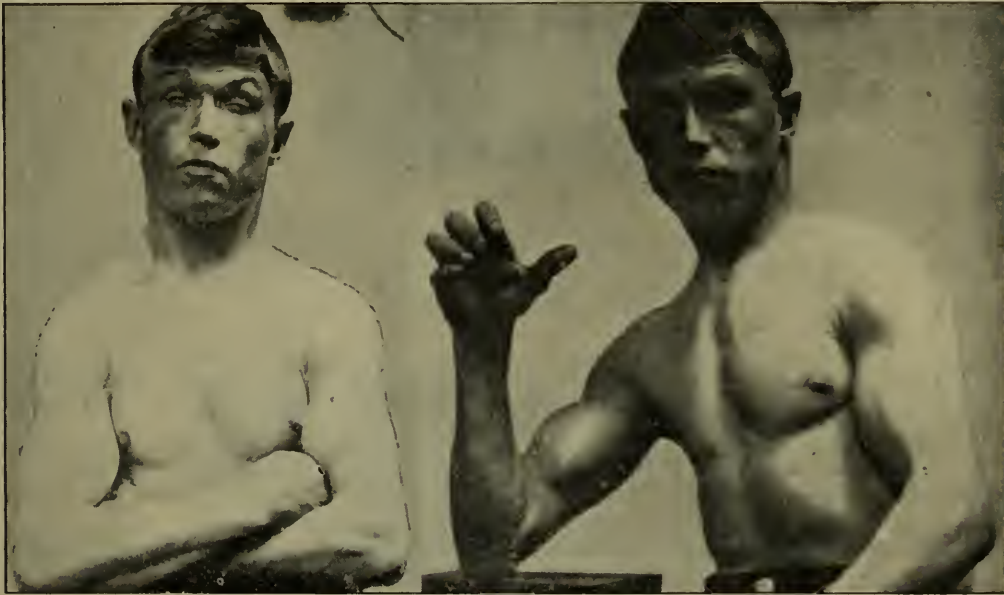


FIG. 4.

FIG. 5.

Fig. 4.—Allan T., showing the attempt to open the eyes after they have been firmly closed. The time taken to open them completely varied from four to six seconds. Note the hypertrophy of temporal and masseter muscles.

Fig. 5.—Allan T., showing myotonia of the muscles of the hand after it has been firmly contracted.

power, however, is not correspondingly increased, but is subnormal. This is especially the case with the muscles of the face, the orbicularis palpebrarum being definitely weak; the face is devoid of expression and approximates to the myopathic type. The myotonic contraction is best seen when the patient is asked to grasp with either hand. The forearm muscles contract firmly and remain contracted, so that



FIG. 6.

Elsie T., showing grooves in the deltoid resulting from myotonic response to mechanical stimulation.



FIG. 7.

FIG. 8.

Fig. 7.—Albert T., showing moderate degree of generalized muscle hypertrophy.

Fig. 8.—Albert T., showing myotonia of orbicularis palpebrarum muscles after the eyes have been tightly closed.

relaxation is abnormally slow. On repeated contraction this delay in relaxation passes off. The condition is also observed with the *opponens pollicis*, but only very slightly with the *interossei*. Occasionally the patient complains of stiffness in the jaws when eating. On a few occasions difficulty in opening the eyes after they have been tightly closed has been observed. On tapping the muscles sharply with a finger a linear groove of contraction appears and persists for five or six seconds (fig. 6). The superficial and deep reflexes are normal. There is no impairment of sensation.

Case III.—Albert T., aged 13, has been unusually well developed since birth, though his strength has never been proportionate to the size of his muscles. Recently he has become slower in his movements, though he can still walk several miles. His muscles are so well developed that he would do for a model for an infant Hercules (fig. 7). The hypertrophy of his mylo-hyoid muscles is so great that it makes him look as if he had a large double chin. The myotonic action is particularly well marked in his hands and *orbiculares palpebrarum* (fig. 8).

Progressive Vertebral Ankylosis ("Spondylose Rhizomélique").

By F. PARKES WEBER, M.D.

THE patient, B. K., now aged 67, is a German bootmaker in London. I saw him first in February, 1904, when he was temporarily under my care at the German Hospital. At that time he suffered from decided limitation of movement in the neck and muscular twitchings in the face. He complained of cervical stiffness and said that he could not rest lying down for a long time in one position. In his muscular rigidity and attitude he had somewhat the appearance of a patient with *paralysis agitans*, without the tremors. He said that since he had had influenza four years previously (in 1900) he had not been well. The influenza had been followed by pains in the chest, cough, and increasing weakness. He recovered from the cough in 1903, but then began to suffer from pains on the left side of the back of the head, and pain on moving his head. He had no pains in the arms and legs, but occasionally a sensation of formication. In 1905 he sometimes had muscular "cramps," so that he could not open his mouth, and also had pains in the loins. Tremulousness of the hands was noticed in 1905.

At present (May, 1914) the whole of the vertebral column and the cranio-vertebral articulations appear to be ankylosed in a position of kyphosis characteristic of such cases (*see* illustration, fig. 1). The ribs apparently do not move with respiration, which is altogether diaphragmatic. He can open his mouth a little. The movement in both shoulders is much limited, more in the right than in the left. There is practically no movement at the right hip-joint, but he can flex his right hip-joint a little. The other (more distal) joints of his limbs are free,



FIG. 1.

The patient B. K. To show the characteristic position in progressive vertebral ankylosis ("spondylose rhizomélisque").

excepting that he cannot extend his knees completely. In the semi-recumbent position he can feed himself with a spoon. He can walk about a little with the help of a stick. Some tremulousness of the hands, suggesting that of paralysis agitans, is often observable. Röntgen skiagrams, taken by Dr. James Metcalfe, of the patient's neck (lateral view) show that all the bodies of the vertebræ are united by a layer of bone at their anterior margins (*see* fig. 2).

There is no history of any venereal disease, and the blood serum gives

a negative Wassermann reaction for syphilis. The teeth and gums are in a very bad condition, with much stone-like incrustation. There is much muscular rigidity or hypertonicity, as if the muscles were "on guard" to shield the joints or to prevent sudden "jarring" movements of the body. The tendon reflexes are active, but, owing to the muscular rigidity, the knee-jerks cannot always be obtained. There is no ankle clonus. The plantar reflexes are of the normal flexor type. The pupils react to light, and ophthalmoscopic examination shows nothing abnormal. Examination of the thoracic and abdominal viscera and of

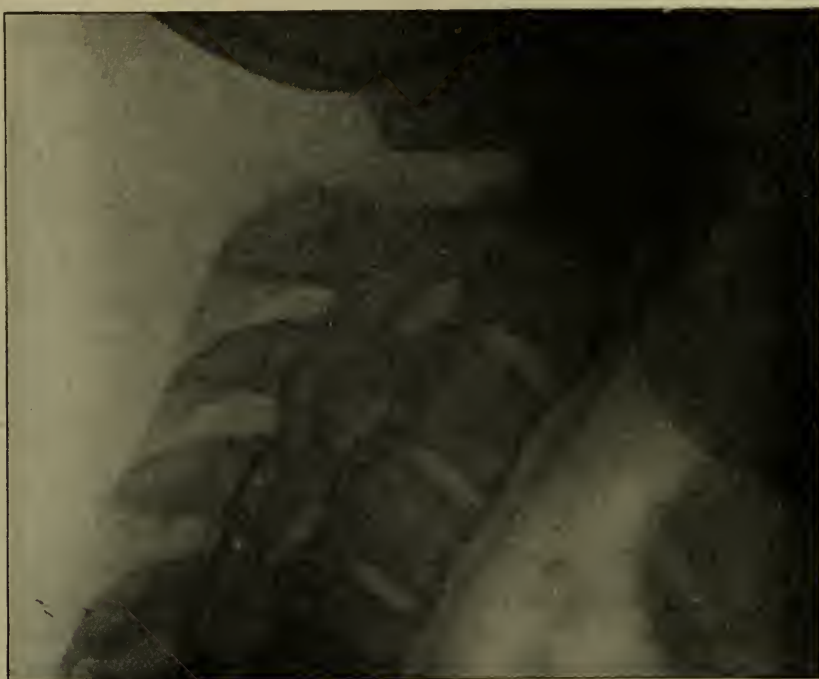


FIG. 2.

Skiagram of the upper cervical region (from the right side), to show bony layer uniting the anterior borders of the bodies of the vertebræ.

the urine presents nothing noteworthy, excepting the occasional presence of slight bronchitic signs.

The appearance of the present case is remarkably similar to that of a patient with the same kind of vertebral ankylosis, whose photograph I illustrated in the *Medico-Chirurgical Transactions* for 1903 (vol. lxxxvi, p. 72, pl. ii). That patient was a middle-aged man who used to live near the German Hospital. I first saw him about 1895, and he died at his own home in 1909 (possibly of pleurisy), when aged 56. He spoke at one time of a feeling "as if there were an iron band round his chest";

there was no movement in his ribs, the breathing being entirely diaphragmatic. He scarcely moved his head at all, and the movements at the hip-joints were much limited, as also were those of the shoulders, though he could move his elbows, hands, knees, and feet. He had ankylosis of the jaw, but he could feed himself through an opening between his teeth, and through the same opening he used to smoke a pipe. He showed a muscular hypertonicity like the present patient and his attitude somewhat resembled that of a patient with paralysis agitans. His knee-jerks were exaggerated; Babinski's sign was absent. Röntgen ray skiagrams of the spinal column showed a shadow at the margins of the intervertebral disks, as if (as in the present case) the vertebral bodies were united by bony substance at their edges. This corresponds to the changes recorded in skeletons obtained from similar cases.

Dr. Parkes Weber added that the state of the muscles in patients of the "spondylose rhizomélique" class suggested that immobilization of the affected joints at an early stage of the affection, of which he had heard from Dr. A. F. Hertz, might be of use *by assisting Nature*. It seemed, indeed, as if in this class of cases the muscles were (by an automatic mechanism on the part of Nature) "on guard" to shield the joints from movement and to prevent sudden "jarring" movements of the skeleton-framework of the body.

Dr. ARTHUR HERTZ said that he had recently had under his care a case which showed that the ordinary treatment of this condition, in which patients were encouraged to move as much as possible, was, in his opinion, incorrect. A gentleman, now aged 25, began to be ill three years ago with pain and stiffness in the left shoulder. His neck was then affected and the pain and stiffness gradually spread down the whole of his spine, finally affecting both hips. His general health deteriorated at the same time, and when Dr. Hertz saw him first in July, 1913, he had lost over 2 stone in weight, was very anæmic, and could only crawl along keeping his spine, left shoulder, and both hips absolutely fixed. An X-ray examination showed that no bony ankylosis had taken place, the rigidity being entirely due to muscular spasm. As the spasm seemed to be protective in origin, it occurred to him that complete fixation of the affected joints would be the most reasonable treatment, and accordingly Mr. W. H. Trethowan made a plaster bed for him. He went to Bournemouth in the plaster bed in October of last year and returned to London in March of this year. On being removed from the bed it was found that his shoulder, his neck and the upper part of his dorsal spine had lost their rigidity, and free movement was possible without pain. The hips were still painful and rigid, but the X-rays again showed nothing abnormal in the joints. A new apparatus was therefore made to fix the hips, and the patient was sent back to

Bournemouth. As the hips were the last joints to be affected it was not unreasonable to expect that they, too, would finally recover. The patient had regained his lost weight and looked and felt in excellent health, so that it appeared that the infection which gave rise to the joint disease had been to a great extent overcome.

Spasmodic Stricture of the Œsophagus (Cardiospasm), with Fusiform Dilatation above it.

By F. PARKES WEBER, M.D.

THE patient from whom this specimen was taken was a bootmaker, aged 80 (in February, 1914), who had been suffering more or less (on and off) from obstruction in the œsophagus since the latter part of 1904. According to the patient's own account the trouble gradually commenced as follows: The food (no matter whether solid, pulpy, or liquid) used sometimes, but not always, to "stick" in the gullet. He had a sensation in the epigastrium as if it was held up just above the stomach. He had a feeling of spasm in the whole gullet, as if the food passed down slowly, but was only absolutely blocked when it reached the lower end. He felt very uncomfortable until he could bring up the food again, which he used to do with a good deal of noise. But the food which he returned in this way was, he said, accompanied by about three times its bulk of frothy liquid with some sticky slime. By pressure from the front he thought he had sometimes been able to make the food in the gullet enter the stomach.

In February, 1906, when in a very starved condition, he came under the care of my colleague Dr. zum Busch, on the surgical side of the German Hospital, who, as no soft bougie could be passed through the cardia into the stomach, performed a gastrostomy (by Witzel's method). After the operation the patient improved very much, and the gastrostomy opening was allowed to close. It was completely closed in March, 1908, and it was quite clear that there was no carcinomatous stricture of the œsophagus present, but the old trouble had returned and the patient had to be fed by a hard œsophageal bougie, as at that time no soft bougie could be passed through the cardia. When he left the hospital again in May, 1908, he was feeling well and had gained 13 lb. in weight. He was a well-built man. His radial arteries were slightly thickened, but there were no signs of disease elsewhere in the body. His father

and mother had lived to about 70 and 69 years respectively. He had twelve children living, one of whom was insane and in an asylum, but the others were said to be sound in body and mind. In November, 1909, Dr. zum Busch had again to dilate the cardia on account of spasmodic stricture.

Since that time the patient has been an in-patient occasionally on the medical side of the hospital. In December, 1909, the house physician, Dr. G. Dorner, found absence of free hydrochloric acid in the stomach contents after a test meal. By examination with Röntgen rays, with the help of food containing carbonate of bismuth, the œsophagus appeared to be slightly dilated above the cardia. The patient, who was being given acid pepsin after his meals, seemed fairly well, though complaining of feeling weak (senile change commencing?). By direct œsophagoscopy in May, 1910, the œsophagus appeared to be dilated close above the cardia. About that time the gastric contents, after a test breakfast, were found to contain free hydrochloric acid (free HCl acidity, 20; total acidity, 42). In May, 1911, the patient had again to be fed by the stomach-tube. In the gastric contents Dr. Dorner repeatedly found absence of free hydrochloric acid; some diluted hydrochloric acid was therefore given after meals. But afterwards (from June 9) sodium bicarbonate, before meals, was tried for comparison, and both these appeared to suit the patient, for he gained decidedly in weight. The following are the results of examinations of the gastric contents, after test breakfasts, in June, 1911. June 12: Free HCl acidity, 20; total acidity, 42. June 14: Free HCl acidity, 32; total acidity, 72. June 20: Free HCl acidity, 41; total acidity, 76.

Patient was again in the hospital for the same complaint in December, 1911, in April, 1912, and in March, 1913. He learned to use an œsophageal tube himself. Examination by Röntgen rays in March, 1913, showed that the bismuth food remained a little time in the lower part of the œsophagus; the stomach itself showed a contraction about the middle of the greater curvature, which Dr. Finzi regarded as a result of the old gastrostomy operation. He was readmitted on March 31, 1914, in a very feeble condition, saying that during the last months he had been losing strength, and that during the last two weeks he had vomited everything. He said that he had had to vomit one or two hours after eating, if he did not empty his stomach with the tube. He had lost flesh rapidly, and had often had pain in the region of the stomach. Apparently a soft tube could be easily passed into the stomach. Examination of the supposed gastric contents showed no free hydro-

chloric acid; total acidity, 52; lactic acid test positive; microscopic examination showed the presence of "long bacilli." On April 4 he had an attack of cardiac syncope, and he died during a similar attack on April 5.

The *necropsy* showed a condition of "brown atrophy" of the heart and some atheromatosis of the coronary arteries and the aorta. There were old calcareous changes at the apex of the left lung, with congestion of the base of that lung and old pleuritic adhesions of the right lung. The right kidney showed scarring from one large and three or four

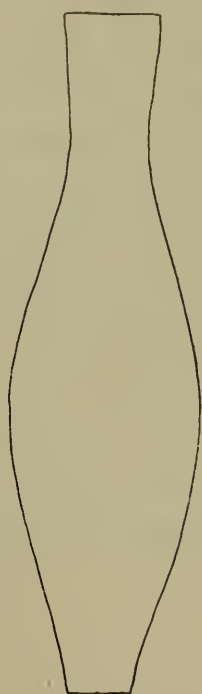


Diagram of the œsophagus (opened and spread out) from its origin at the level of the cricoid cartilage above to its termination below at the cardiac orifice of the stomach. To show the degree, shape, and position of the dilatation.

small infarcts (all of them old, and probably due to embolism connected with the aortic atheroma). Otherwise nothing special was observed beyond the condition of the œsophagus and stomach, which were removed *in toto* for further examination.

The cardia, which did not appear much (if at all) thickened, admitted the passage of the middle finger; yet the stomach was empty, and the œsophagus contained food. There was decided fusiform dilatation of the lower part of the œsophagus. The shape and relative position of the dilatation are shown by the accompanying diagram (*see figure*),

which is a reduced copy of the outline of the œsophagus (after it had been preserved for some days in formalin, &c.), as it appeared when slit open and spread out on a flat surface. The stomach showed a slight contraction, corresponding to that previously noted by Röntgen ray examination, and probably connected with the old gastrostomy. Microscopical sections were cut (1) of a piece of the wall of the œsophagus at the level of the greatest dilatation, and (2) of a piece of the cardiac orifice of the stomach. Mr. S. G. Shattock has kindly furnished me with the following report of these sections: "The section from the middle of the œsophagus presents a perfectly sound structure, the few small groups of lymphocytes in the mucosa being a natural condition. As to the cardia, the muscularis is quite normal and there is no fibrosis of the mucosa. The investing epithelium is everywhere absent from both situations, the loss having obviously occurred after death."

It appears doubtful whether the soft œsophageal tube really entered the patient's stomach during the last days of his life. The supposed stomach content, in which there was lactic acid but no free hydrochloric acid, may have come from his dilated œsophagus. In the present case there can scarcely be any doubt that in spite of the characteristic absence (or almost entire absence) of hypertrophy of the cardia, the dilatation of the œsophagus was secondary to the cardiospasm. But what the exact cause is of the cardiospasm in the severe and dangerous type of cases, of which the present one is an excellent example, remains a mystery.

DISCUSSION.

Dr. ARTHUR HERTZ said that five years ago, after examining the specimens of so-called idiopathic dilatation and hypertrophy of the œsophagus in the Guy's Hospital Museum, he came to the conclusion that the condition could not arise from a spasm of the cardiac sphincter in accordance with the commonly accepted view. The symptoms were often present for many years before death, and it was quite inconceivable that a spasm of such long duration should not lead to any hypertrophy of the cardiac sphincter. In all the specimens which he had seen the absence of hypertrophy of the cardia and the absence of any obvious obstruction after death had been in striking contrast with the degree of hypertrophy of the œsophagus itself. He believed that the condition was really due to the absence of the normal relaxation which should occur when each peristaltic wave, travelling down the œsophagus, reached the cardiac sphincter. It had been experimentally shown that section of the vagi below the origin of the recurrent laryngeal nerves prevented this relaxation, and led to the

accumulation of food in the œsophagus, which consequently became dilated. He believed, therefore, that the so-called idiopathic dilatation and hypertrophy of the œsophagus was not due to cardiospasm but to incoördination of the neuro-muscular mechanism of the lower end of the œsophagus. In correspondence with this view he had found that, in spite of the fact that peristaltic waves were unable to overcome the obstruction, the weight of an indiarubber tube filled with mercury was sufficient to enable it to drop without difficulty through the relaxed cardia into the stomach. He had had half a dozen cases in which such a tube produced complete relief if passed before the beginning of each meal, as it enabled the food to be taken without difficulty. After a time the frequency of its passage could be diminished as the cardia became permanently dilated, until, finally, a complete cure resulted.¹

Dr. PARKES WEBER said if Dr. Hertz's explanation were correct, it seemed as if so-called "spasmodic stricture" of the cardiac end of the œsophagus was rather a kind of break in the continuity of œsophago-gastric muscular movements—in fact, a kind of dissociation (more than incoördination) between the downward wave of œsophageal movement and the corresponding (or normally associated) movement of the cardiac orifice of the stomach. Such a state of affairs might almost be compared to what occurred in cases of "heart-block"—perhaps the analogy would turn out to be more than a superficial one. Such a dislocation in the continuity of movement along a contractile muscular tube would, of course, if it occurred, tend to the "holding up" of what was passing through the tube and secondary dilatation from accumulation and backward pressure above the site of the disorder. Dr. Weber did not understand why such a slight dilatation as that obtained by the passage of a mercury-rubber bougie through the cardia should be of so much practical utility as Dr. Hertz had found it to be.

¹ Since making the above remarks Dr. H. D. Rolleston has told Dr. Hertz that he came to an almost identical conclusion with regard to the pathology of so-called idiopathic dilatation of the œsophagus as long ago as 1896 (*Trans. Path. Sec.*, 1896, xlvii, p. 37).

Cancer of Rectum ; Excision after application of Radium.

By CHARTERS J. SYMONDS, M.S.

SPECIMEN was removed from a gentleman, aged 73, on April 1, 1914. On October 10, 1913, there was a typical annular growth, $1\frac{1}{2}$ in. from the anus. A piece of unaffected mucous membrane about the breadth of the finger between the two ends of the growth. On October 27 radium was applied by Dr. Pinch on five consecutive days for six hours. The amount of radium employed was 100 mg. of radium bromide screened with 2 mm. of lead and 3 mm. of rubber. On November 7, both to the finger and to the eye all appearance of growth had disappeared. There was a complete ring of cicatricial tissue, the free part of the bowel being no longer visible. On February 3, 1914, colostomy was necessary for the relief of symptoms due to the stricture. On April 1 the disease was removed by the perineal route, the proximal end being sutured to the anal portion, without division of the sphincter. Complete union of the bowel took place, and the colostomy wound was closed on May 1.

The specimen shows what appears to be a cicatricial stricture. Healthy mucous membrane above, while below it looks smoother than normal, and the muscular coat seems thickened. Two small hard glands were present in the meso-rectum. Microscopically the typical appearance of a cicatrizing cylindrical epithelioma is seen in the section, through the stricture, and also in the lymphatics. The whole of the rectum below the stricture, though appearing thickened, does not show any growth.

The specimen is exhibited to show the favourable effects of radium.

Arthritis associated with Psoriasis.

By T. L. ELLIS and H. D. ROLLESTON, M.D.

A COACHBUILDER, aged 35, has never had syphilis, gonorrhœa, or rheumatic fever. The Wassermann reaction was negative. Twenty years ago he had left-sided pleurisy, and about the same time he injured the left knee, but he had no further trouble with it until about four years ago, when it became painful and stiff, about one month after psoriasis had appeared for the first time. Two years ago he was treated for six months with arsenic, and both the psoriasis and the arthritis disappeared. In November, 1912, the psoriasis and the arthritis gradually recurred, and in April, 1913, he was treated with ionization without any improvement. Radiography showed slight irregularity of the inner surface and inner condyle of the femur and the head of the tibia near the articular surfaces, thus suggesting slight superficial osteitis. Some carious teeth were removed, and about this time the right knee became affected. In October, 1913, he had, in addition, some stiffness of the temporo-maxillary joints, some more bad teeth were removed, and a vaccine prepared from streptococci and pneumococci, isolated from the sockets, was given with some slight benefit. The psoriasis practically disappeared under arsenic and local treatment (butyl-salicylate was employed as well as the ordinary external applications), but the arthritis did not, as on a former occasion, show a corresponding improvement. The arsenic was discontinued on account of abdominal pain, and the psoriasis is now returning. The nails show the results of psoriasis. Aspiration of the knee and bacteriological examination of the fæces have failed to throw any light on the cause of the arthritis. The urine yielded a diphtheroid organism and a Gram-positive coccus. The temperature has been practically normal throughout. Treatment by leucodescent light and strapping has been employed, and quite recently, in the light of R. Pemberton's¹ conclusions that rheumatoid arthritis is a metabolic disease due to intolerance to ordinary quantities of protein and carbohydrate food, a restricted diet combined with thyroid extract is being tried. The knees are swollen, painful and stiff.

¹ Pemberton, *Amer. Journ. Med. Sci.*, Philad., 1914, cxlvii, p. 434.

Dr. PARKES WEBER remarked that, though the association between chronic joint disease and a skin disease (psoriasis, eczema, or exfoliative dermatitis) was a rare one, it attracted special attention because in such cases the articular affection was usually a severe one and several joints were involved.

Rupture of Aneurysm of the Abdominal Aorta in a Young Woman.

By J. ALISON GLOVER, M.D.

THE case of which I have been asked to read you a few notes this evening is that of an unmarried English lady, aged 34. Her family history is excellent, and with the exception of an operation for *talipes equinovarus* in infancy, her own history of past illnesses was uneventful, though she was never robust. A leisured, cultured lady, fond of open air, though not athletic, she was singularly enduring of pain. The first manifestation of the disease, which proved fatal to her on February 10, seems to have been an attack of pain in the back, which occurred four months previously in mid-October, 1913, whilst she was on a visit in the country. It was attributed to lumbago, and she had no medical examination or treatment. The only other previous incident with a possible bearing on the case was a severe mental shock, which she received at the end of November—a young friend, in whose mother's house she was staying, and with whom she had been sitting but a few minutes before, dying of sudden hæmoptysis. There is nothing else to record, that is from the end of November until Sunday, February 1. Coming home from morning service, after ascending a slight hill, she was seized with a sharp pain in the back rather towards the right hip, sufficient to make her feel very faint. She was, however, able to walk home and did not go bed.

The next day I saw her up and dressed, and apparently much as usual, but still complaining of some pain, which she thought was lumbago. The pain on the Sunday had evidently been very severe, and with the possibility of a renal colic in my mind, I asked for a specimen of the water, and that she should remain in bed for examination. The temperature was 99° F., the pulse normal. On examination, the pain had nearly gone, what remained being over the right hip and buttock. There was no swelling or tenderness to be felt anywhere, no murmur in the heart, no tenderness over the spine or on pressing down the head.

The knee- and ankle-jerks were normal. The abdomen moved freely. The urine was loaded with urates but otherwise normal. The menses had been regular and there had been no special constipation. For a week she remained much the same—sometimes quite free from pain—but at night, when the temperature rose to just under 100° F., the pain was sufficient to give her bad nights. On the Saturday night she had so bad a night that I saw her on Sunday evening at 9 p.m., when I was pleased to find her free from pain, the temperature normal and pulse 72, and her condition so satisfactory that the slight uneasiness which I had felt about her in the morning was quite allayed.

Just eleven hours later, at 8.15 on Monday morning (eight days after the first pain), I received an urgent summons and found her blanched, unconscious, pulseless, and apparently dying. Pain had come on soon after I had left the previous night and she had had a bad night. After a morning cup of tea she had got out of bed to wash, and had suddenly a terrible pain which made her vomit and then faint. She was just able to get back to bed and to ask the maid to call her mother. It was only too obvious that some internal catastrophe had happened, and a large tense mass could now be felt in the right side and groin, feeling not unlike a large appendicular swelling. I gave digitalin and strychnia hypodermically, and, as the only hope seemed to be in immediate operation, telephoned for Mr. Kellock and Dr. Visick, and prepared for operation, pending their arrival. The patient rallied slightly with the injection and some rectal saline and recovered consciousness.

About two a half hours after the attack ether was administered and an incision made over the mass. The intestines were blanched but healthy, the appendix—much to my relief—quite healthy, and there was no free blood in the peritoneum. The mass was a huge retroperitoneal hæmorrhage. A tube was inserted and the wound closed. She rallied well from the operation, and had a comfortable night, but next morning, twenty hours after the operation, she died suddenly.

I obtained permission to make an examination by slightly enlarging the operation wound, and found a large retroperitoneal hæmorrhage stripping the lumbar and pelvic peritoneum, invading the right broad ligament and some of the mesentery. With large quantities of recent clot, some apparently older clot was found over the psoas region. The origin was a ruptured aneurysm of the aorta, about the origin of the right renal artery. I could feel no erosion of the vertebral column.

The rarity of this condition in a woman aged 34 is apparent when we remember that whilst aneurysm of any part of the aorta is fortunately

uncommon, the number of the aneurysms of the abdominal aorta amounts to scarcely 5 per cent. of the total of aortic aneurysms. Of these 5 per cent. only one-tenth occur in females, and of this small fraction scarcely a third occur in the decade 30 to 40 years.

Of the difficulty of correctly diagnosing an abdominal aneurysm, even after rupture, I have had tragic and, I trust, unique experience, my father, whom some of you will remember as a Vice-President of the Clinical Society, and my uncle having died of the rupture of abdominal aneurysms within two months of each other. In each case the condition was only discovered by post-mortem examination.¹

¹ Dr. H. D. Rolleston has kindly referred me to a very similar case in a woman, aged 30, recorded in the *Trans. Path. Soc. Lond.*, 1894, x1, p. 53.

I

PROCEEDINGS

OF THE

ROYAL SOCIETY OF MEDICINE

VOLUME THE SEVENTH

COMPRISING THE REPORT OF THE PROCEEDINGS FOR THE
SESSION 1913-14

Section 6.

DERMATOLOGICAL SECTION

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1914

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The Society does not hold itself in any way responsible for the statements made or the views put forward in the various papers.

Dermatological Section.

October 16, 1913.

Dr. J. J. PRINGLE, President of the Section, in the Chair.

Case of Granuloma Annulare.

By S. E. DORE, M.D.

THE patient, a gentleman, aged 55, had complained of the condition of the hands for two years. The history indicated that the lesions began as raised papules or disks, and then spread centrifugally, the centre undergoing involution. The oldest lesion, of a duration of two years, was now involuting at the edge. Another patch was bisected by the scar of a leopard bite which he had received in Ceylon, where he had lived for many years. He also presented so-called "tropical skin"—i.e., atrophy and pigmentation of the back of the hands. The exhibitor invited suggestions as to treatment, particularly as to the application of X-rays.

DISCUSSION.

Dr. PERNET said that X-rays acted favourably in these cases, generally clearing up the condition.

Dr. GRAY said he had a patient with granuloma annulare on both hands. On one hand a biopsy was done, and the hand tied up, when, as not infrequently happens, the lesions cleared up. The two patches on the other hand received pastille doses of X-rays, which caused them to disappear. On removing the bandage from the first hand the condition recurred, but the hand treated with the rays remained cured. The case was shown at the International Congress of Medicine.

Dr. WHITFIELD agreed that the slight hyperkeratosis of tropical skin disappeared on the application of X-rays, and did not return. He agreed

tentatively with the diagnosis in this case, but the fact that the patient came from Ceylon led him to suggest examination by means of abrasions, and by staining films; there were other diseases affecting people in Ceylon.

Dr. DORE, in reply, said that he would use X-rays, and if opportunity presented would carry out Dr. Whitfield's suggestion. Some of the lesions had recovered spontaneously, but one had relapsed.

Case of Raynaud's Disease with Onychia.

By E. G. GRAHAM LITTLE, M.D.

THE patient was a young lady, aged 29, a sister in a convent in London. The Raynaud phenomena were typical, and included the alter-



Case of Raynaud's disease with onychia.

nate blanching and reddening of the extremities with subjective sensations of tingling and numbness; these sensations recurred two or three times a week. When first seen the nails were peculiar; the free edge for a distance of about one-third of the length of the nail was bluish in colour, with increased convexity and raised off the nail-bed, from which it was separated by $\frac{1}{8}$ in. or more; this part of the nail was not especially thickened or brittle; unfortunately the patient, disliking the disfigure-

ment caused by the discoloration, had cut the exaggeratedly convex free end down to the middle third, where the nail was grossly thickened, but not discoloured. The photograph taken before the paring of the nails, which altered their aspect materially, shows this discoloration especially well in the left thumb. The same changes were present in all the nails of both fingers and toes, and had persisted for about eighteen months.

DISCUSSION.

The PRESIDENT (Dr. J. J. Pringle) said that although "Raynaud's phenomena" were undoubtedly present in the case exhibited, the general condition of the nails and finger tips was neither that of "sclerodactylia" nor of gangrene, either of which so frequently obtains in Raynaud's disease. He asked whether scrapings had been microscopically examined with the view of excluding ringworm, which was strongly suggested by the heaping up of the nail-matrix, pushing back the nail substance. He had recently seen an adult with a precisely similar condition of all the finger-nails, apparently of ten years' duration, in which ringworm fungus was easily found.

Dr. ADAMSON also thought the condition extremely suggestive of ringworm of the nails.

Dr. F. PARKES WEBER did not consider it likely that the condition of the nails had anything to do with Raynaud's phenomena. He had never heard of any exactly similar thickening of the nails having been associated with Raynaud's disease.

Dr. GRAHAM LITTLE replied that scrapings had been taken on two occasions from several of the nails of both fingers and toes, especially from the thickened middle third of the nail, and submitted to prolonged and careful microscopic examination with a uniformly negative result. In his opinion tinea unguinum could therefore be excluded. There were no other symptoms of psoriasis, so that the latter diagnosis could not be positively affirmed.

Case of Acne Varioliformis.

By E. G. GRAHAM LITTLE, M.D.

THE patient was a woman, aged 47, who had had this disease for the past two years. There were closely grouped, shallow pitted scars characteristic of this eruption on the forehead at the junction of the hair and skin, on the temples, at the angles of the nose, and over an area the size of the palm of the hand, on the intermammary portion

of the chest. There were also some fresh small follicular ulcers in these areas, as well as the older scars. The scalp was very scurfy, but there were no lesions of the disease in that situation. The patient was unmarried, had had no children, and gave a negative Wassermann reaction. She had not had acne vulgaris, and the disease had commenced at an age at which acne vulgaris could be put out of court. The case was unusual in its severity and in the sex of the patient.

DISCUSSION.

The PRESIDENT regarded the case as of great interest. As far as he knew it was not generally recognized that acne varioliformis could be so acute and widespread. He had, however, had under observation two cases in which the whole scalp, the whole of the face, and a large portion of the neck and upper part of the chest were involved in an intensely acute, impetiginous pustular eruption, the nature of which, in the first instance, he was unable to determine. He was only able to make a firm diagnosis after the acute phenomena subsided. The condition in both instances continued to relapse, but in a minor degree, during many years, independent of and almost uninfluenced by treatment. He asked whether members had had experience of treating this disease by means of staphylococcus vaccines; his own results from them, not only in the two cases referred to, but in a considerable number of others, had been negative; but he remembered a paper by a well-accredited American dermatologist, Dr. Engman, of St. Louis, claiming uniformly brilliant results from the use of staphylococcus vaccines in acne varioliformis. Dr. Engman's paper¹ led one to believe that the disease was much more common in America than in this country.

Dr. BUNCH said he had X-rayed two cases of the disease, doing one side at a time, with a full pastille dose. Later he X-rayed the other side also, and the treatment was in each case followed by a disappearance of the lesions.

Dr. GRAHAM LITTLE replied that he had not tried a vaccine for the condition. It was rare in his experience; he had never before seen it in a woman, and in his ten years at St. Mary's Hospital he had not seen more than half-a-dozen instances of the disease.

¹ *Journ. of Cutan. Dis.*, 1910, xxviii, p. 563.

Case of Chronic Hypertrophy of the Lips.

By E. G. GRAHAM LITTLE, M.D.

THE patient was a young man, aged about 28, who had suffered from swollen lips for about three years. Both lips were greatly enlarged, covered with hyperæmic mucous membrane, without noticeable fissures or increased glandular secretion. The degree of swelling varied within certain limits, increasing and decreasing from time to time, but never receding to normal limits of size. Owing to the persistent swelling the lips were everted, shiny, and rather dry than moist. There was no nasal discharge, but there were numerous carious teeth, especially in the front of the mouth. The gums were not swollen or tender. Wassermann's reaction was negative.

Case of Leprosy.

By J. H. SEQUEIRA, M.D.

THE patient, a healthy-looking married woman, aged 52, was born in Odessa, and had lived there until eight years ago, when she came to London with her family. Four years ago the patient noticed a red itching spot on the cheek. In the course of two years the eruption spread over the body. The left leg was first affected two years ago. Fresh lesions have made their appearance from time to time and others have faded. The patient was unable to give a connected account of her illness, but apparently the eruption itched and some of the areas have been painful. The whole of the trunk was affected. The eruption consisted of erythematous patches, varying in size from a half-crown to the palm of the hand. In some there was slight but definite infiltration, and on the back there were several irregular, rounded, infiltrated plaques of deep brown colour, with central depressed white areas of irregular or festooned outline. The left leg was similarly affected, but at the junction of the middle and lower third of the shin there were two brown, raised, smooth, elongated keloid-like tumours, the larger being $1\frac{1}{4}$ in. in length and $\frac{1}{2}$ in. in width. Near these elevations were several small, round, less infiltrated lesions which appeared to be an early stage of the keloid-like plaques. The depressed atrophic areas on the back

were anæsthetic, and there were extensive areas of anæsthesia on the left leg. The ulnar nerve could be felt but did not appear greatly thickened. The Wassermann reaction was negative. The blood examination gave the following differential count: Polynuclear neutrophils, 57·5 per cent.; polynuclear eosinophiles, 2·0 per cent.; large lymphocytes, 22·5 per cent.; small lymphocytes, 10·0 per cent.; large hyaline cells, 8·0 per cent. There was no nasal discharge.

A small infiltrated nodule of recent development was excised and sent to Dr. Panton for examination. He reported that the histology of the lesion was that of a chronic infective granuloma. The cellular infiltration consisted of lymphoid, endothelial and plasma cells. There were also giant cells of small type with central nuclei. There were no areas of caseation. Acid-fast bacilli were extremely numerous, many of them being packed in the giant cells in the manner typical of a nodule of leprosy.

DISCUSSION.

Dr. WHITFIELD said that apropos of the method of diagnosis in the absence of bacilli in scrapings, one could make use of the Wassermann test in combination with the old tuberculin reaction. Syphilis did not react to tuberculin but gave a positive test by Wassermann's method. Leprosy gave a positive reaction with tuberculin and a positive Wassermann's reaction. Tuberculosis gave a positive reaction with tuberculin but not by Wassermann's method. In this way a doubtful case might be cleared up. A positive Wassermann and negative tuberculin indicated syphilis; a positive Wassermann and positive tuberculin indicated leprosy (unless, of course, both syphilis and tuberculosis were present); a negative Wassermann and positive tuberculin indicated tuberculosis. Some years ago he applied this test in a doubtful case which he saw with Dr. Colcott Fox. The result was an indication of congenital syphilis, much to the surprise of the parents. The lesion only partially cleared under mercury and he finally excised it. On examination it was found that leprosy and tuberculosis could be excluded, so the lesion probably was syphilitic.

Dr. PERNET said Dr. Radcliffe Crocker had a case of leprosy in the old days when the tuberculin of Koch was first introduced, and he injected the patient with that, with the result that an attack of leprous fever was excited and a copious outbreak of fresh leprous nodules ensued.¹

Dr. SEQUEIRA, in reply, considered it a mistake to say that all cases of leprosy showed a positive Wassermann reaction. In three cases of the disease, including this one, the Wassermann reaction, done by Dr. Fildes and Dr. McIntosh at the London Hospital, was negative.

¹ Radcliffe Crocker, "Diseases of the Skin," 3rd ed., p. 862.

Case of Multiple Idiopathic Pigment Sarcoma (so-called) of Kaposi.

By J. H. SEQUEIRA, M.D.

S. F., A TAILOR, aged 46, was admitted to the London Hospital on August 1, 1913. He was a rather stout man, of pale complexion, dark hair turning grey, and looked much older than his years. He was of Hebrew extraction and was born in Poland. He had lived in the East End of London for the past eight years. His wife enjoyed good health, and they had two healthy children.

Present illness: Two years ago the patient noticed on the left foot just above the ankle a purplish swelling, which gradually spread all over the foot in the course of the next six months. Twelve months ago some spots appeared upon the right foot and these gradually spread. During the past two months similar small swellings have appeared about the left wrist and hand. Two months before admission to the hospital the left foot became more swollen. The lesions upon the feet were painful, but those about the wrist itched slightly. The pain in the feet prevented the patient from standing for any length of time, and for several months during the past year he has been unable to do any regular work. There was no history of any other illness, and there had been no gout or joint trouble.

The condition of the skin: Left foot—The dorsal surface over nearly the whole extent of the foot and over the ankle as far as each side of the tendo Achillis was of a purple-red colour and had a swollen appearance. Beginning behind the external malleolus and curving round this prominence to cross the front of the ankle in an almost straight line there was a raised, purplish, infiltrated edge. Towards the inner side of the foot this edge was made up of small discrete papules about the size of a hemp to a lentil seed. In front of the inner malleolus was an irregular triangular area of normal skin, and a similar but rounded patch was present over the metatarsal region of the fourth and fifth toes. Towards the ankle the affected area was purplish, definitely raised and infiltrated, while at the side of the foot the colour was redder, fading gradually into that of the normal skin of the sole without a definite line of demarcation. All over the purplish area palpation gave the impression of infiltration, which at the root of the

toes suggested a sclerodermatous condition. The infiltration was so dense that the patient was unable to move the toes readily. There was no tenderness and the area did not pit on pressure. About 2 in. above the internal malleolus there was a discrete, rough, square-shaped lesion, rather less than a sixpenny piece—which was raised, flat, quite hard, and of purple colour, the covering epidermis being immobile over the swelling. Right foot—Behind the internal malleolus were two lentil-sized purple papules. In front of the external malleolus there were three similar lesions, and scattered over the dorsal surface of the foot, especially in its outer half, there were several similar papules. The whole of the dorsum of the foot had a rather dusky red appearance, and on palpation gave the sensation of infiltration, but this was much less marked than that on the left foot. There was neither tenderness nor œdema. Left wrist and hand—On the dorsal surface of the left hand and on the ulnar side of the front of the wrist there were several purple papules of similar character to those on the right foot. There was no infiltration about the lesions on the back of the hand and only a slight degree on the front of the wrist. The rest of the skin was free from the eruption.

General condition: There was no evidence of disease in the thorax or abdomen. The knee-jerks were present, and there was a flexor response to the plantar reflex. The pulse was 78 per minute, regular, small volume; blood-pressure, 150 mm. by the Riva-Rocci instrument. Urine acid, straw colour, specific gravity 1016, no albumin and no sugar. The Wassermann reaction was negative.

The lesions were being treated by X-rays with some apparent improvement. Two portions of the affected skin were removed for examination, and the following report was kindly made by Dr. H. M. Turnbull:—

SPECIMEN I, REMOVED AUGUST 12, 1913.

Macroscopic.—A piece of skin fixed in formol 0·7 by 0·4 cm. Epidermis and a narrow zone of dermis could be recognized.

Microscopic.—A small portion of epidermis and dermis. The epidermis is crenated, so that small papillary projections are formed. Its surface is covered by a layer of horn. The basal cells occasionally contain granules of melanin. There are some sweat-ducts in the section; granules of melanin are present in the peripheral epithelial cells of the walls of the proximal parts of the ducts. In the papillary portion of the dermis the capillaries are conspicuous: the papillæ are

cut tangentially and usually show cross-sections of four or five small patent capillaries. Evenly distributed throughout the rest of the dermis are numerous cellular areas. These areas are in the normal position of the vessels of the dermis, for instance round the sweat-ducts. They consist of groups of closely packed capillaries. The majority of the capillaries are merely small spaces lined by a layer of endothelium; a few have an outer row of similar cells, which are separated from the endothelial lining by collagenous fibrils. The groups of capillaries lie in a scanty stroma of a delicate fibrillar tissue, which contrasts sharply with the stout fibres of the surrounding dermis. This stroma contains a very few spindle cells and a few free, rounded or polygonal cells. Many of these free cells lie in small spaces, and are evidently desquamated endothelial cells in capillaries. Others are not connected with capillaries: they are mononuclear cells with basophile protoplasm: a very few resemble lymphocytes, the majority resemble free endothelial cells. Elastic fibrils are present in the areas occupied by the capillaries. The capillaries throughout the section have a patent lumen, but are almost all empty. There are no plasma cells (Unna-Pappenheim stain). There is no pigment in the dermis.

SPECIMEN II, REMOVED AUGUST 23, 1913.

Macroscopic.—Two pieces of skin measuring 0·8 by 0·4 cm. The epidermis is white and beneath it is a tissue 0·1 cm. thick.

Microscopic.—The appearances resemble those of the previous section. There are a few more spindle cells and free cells in the stroma of the areas which are occupied by the capillaries. A few tissue mast cells are present in the adjacent dermis.

REMARKS BY DR. TURNBULL.

The chief abnormality visible in the skin is an increase in the number of capillaries. This increase appears to be due to an actual proliferation, and not to be due merely to a congestion rendering the capillaries more conspicuous. This proliferation has taken place in the normal position of the vessels. Round and between the capillaries there is a slight proliferation of spindle fibroblasts, and a slight infiltration by mononuclear basophile cells: the majority of these cells appear to be free endothelial cells, a few resemble lymphocytes. There are no leucocytes, and no plasma cells.

I have compared the sections with those of a small portion of skin which was sent to me by Dr. Sequeira three years ago as an example of Kaposi's multiple idiopathic pigmented sarcoma (Michael Cohen, aged 78, 1910). In this case there are in one portion of the dermis areas in which there are numerous engorged capillaries. The increase in the number of capillaries is less obvious, however, whilst the stroma in which they lie is abundant and more cellular. There are a few plasma cells in the stroma and several perivascular groups of plasma cells are present in the adjacent portion of the dermis which is free from the areas of capillary congestion. Elastic fibres are not present in the stroma between the engorged capillaries. Moreover, in the affected and unaffected dermis there is a great amount of intra- and extra-cellular pigment. This pigment gives the reaction of iron. In this case of Kaposi's so-called "sarcoma" there appears to be a chronic inflammation of the dermis which is associated with engorgement, and possibly proliferation of capillaries, and with the deposit of much pigment derived from hæmoglobin. In the case now reported there is an apparent proliferation of capillaries, less evidence of inflammation and no deposit of pigment. The presence and absence of pigment constitute the most striking difference between the two cases. The deposit of pigment, however, is doubtless merely a secondary phenomenon due to hæmorrhages from engorged capillaries. Both cases may represent phases of hæmangiomatous condition, which is of the nature of an inflammatory reaction rather than a true blastoma. In neither case is there evidence of sarcoma.

DISCUSSION.

The PRESIDENT expressed his great interest in the case, as he had observed two similar ones, to one of which Dr. Sequeira had referred, in which life was threatened for years, but ultimately many of the masses underwent spontaneous involution. The muscles of the hands were greatly atrophied, presumably by pressure, and there was resulting clawing of the fingers like that of nerve leprosy. He would be interested to hear Dr. Sequeira's opinion as to the precise nature and pathological affinities of the disease. He could not help thinking that it was allied to granuloma fungoides. It was universally agreed that the condition should not be called sarcoma. Had the exhibitor seen anything to justify the "gouty" causation of the condition which had been invoked by the late Sir Jonathan Hutchinson?

Dr. MACLEOD said that he had examined sections from a similar case and had found that histologically the growth was not a sarcoma but consisted of

organizing connective tissue cells associated with marked vascular dilatation and the disposition of blood pigment. In its histology it somewhat suggested mycosis fungoides, but the tissue was not so broken up.

Dr. F. PARKES WEBER thought that in this disease a distinction in regard to microscopic appearances should be drawn between two types of lesions; there were, first, blue nodules well under the skin, and there were, secondly, the later and more projecting, more granulomatous and moist or discharging lesions. Some of the latter became pendulous and were, of course, particularly easily removed. In some cases a biopsy of an early lesion, a blue nodule, had been made, but probably more often one of the little projecting or pendulous growths had been removed for microscopical examination.

Dr. SEQUEIRA replied that he had shown two patients suffering from gout who had this condition, one of whom was the sole patient seen in this country who was not a foreign Jew. He had many attacks of gout while under his care. The second case of the kind he had seen with gout was that of an elderly man who was born at Cardiff, of German parents. In three other cases there was no gout.

Case of Nævus Linearis Bilateralis (Mixed Systemic Nævus).

By W. KNOWSLEY SIBLEY, M.D.

A YOUTH, aged 16, of the average intellectual standard, states that the condition commenced on the front of both knees when he was aged 3 months, and shortly afterwards on the sides of the neck. There is no obvious lesion on the knees now. The condition in many places, such as sides of the neck, arms, and forearms, is more or less symmetrical, and affects the patient to varying degrees, from a simple pigmentation of the skin in some places, to raised, pigmented, warty nævoid conditions; in other parts to a markedly hard, horny growth, tending to a band formation, as, for instance, down the ulnar surface of the left forearm and the interdigital spaces of the ring and little fingers of this hand, extending to the palmar surface; the right hand being free from lesions. The whole scalp area is deeply pigmented a dirty brown colour, much the same shade as that of the hair, which is thin and scanty. Considerable pigmentation and slightly raised, more or less isolated nævi are present in abundance over the face. The oral mucous membrane is extensively affected, so also the whole surface of the tongue. Markedly warty nævi are present in the right nostril and to a lesser extent in the left. Raised deeply pigmented bands extend more or less

all round the neck. On the front of the chest a large area of reddish nævi are present over the left pectoral region, extending slightly across the median line. On the abdomen a typical linear nævus is present on the left side, being strictly limited to the median line. Over the back there are irregular patches of pigmentation with very slight nævoid condition in places. Small lesions are present about the anal region. The lower limbs are not visibly affected and the nails are normal.

A section of a piece of the nævus taken from the neck revealed the following characters: (1) The stratum corneum was thickened; (2) the stratum granulosum was well defined; (3) the stratum mucosum showed a proliferation and pigmentation of the cells; (4) the basal layer showed marked pigmentation; (5) the interpapillary blood-vessels were dilated and surrounded with cells; (6) cell infiltration was present in the upper part of the dermis. Mast cells could not be detected.

A section taken from the pigmented area of the left forearm appeared to be an early stage of the same pathological condition, in which there was a marked pigmentation of the basal layer, and of the cells above this, together with some pigmentation of the cells in the upper part of the dermis.

DISCUSSION.

The PRESIDENT suggested that it was unnecessary to attach the epithet "bilateralis" to the nomenclature of the case, as such extensive mixed nævi were generally bilateral; while the adjective "linearis" was only partially true. The case was an extremely interesting one, and the very marked implication of mucous membranes was quite an exceptional and important feature of it, although not unprecedented.

Dr. STOWERS remarked that the involvement of the mouth and nose in this patient was of special interest. In the very remarkable case which he exhibited in 1908¹ of a young girl who had been the subject of the disease for upwards of nine years, and in whom the outstanding lesions upon the skin were of such unusual character and development that involvement of the mucous membranes might have been anticipated, they were entirely free.

Dr. SEQUEIRA said that recently he showed before the Section a child with a linear nævus in the neck, in whom the soft palate was involved. Some years ago he had an extensive case similar to Dr. Sibley's, in which the special point of interest was that, although the age of the patient was only 28, he developed epitheliomata on some of the lesions.

¹ *Brit. Journ. Derm.*, 1908, xx, p. 1 (with illustrations)

Case of Vesicating Urticaria.

By J. M. H. MACLEOD, M.D.

THIS was a case in which lesions of the type of vesicating urticaria were present on the face, arms and hands of a young girl. The object of showing the case was to elicit the opinions of the members as to the category in which such cases should be placed. The patient was a healthy-looking girl, aged 12. Her family history revealed no hereditary disease or weakness, and her parents were alive. She had enjoyed excellent health, except for attacks of measles and whooping-cough. Her present cutaneous affection had begun five weeks ago, about a fortnight after coming to London from North Wales. The onset of the eruption was not associated with any general symptoms or any digestive disturbance. At that time, towards the end of August, the weather in London was very hot, and she thought the heat and thirst from which she suffered might have something to do with the causation of the eruption.

The eruption appeared simultaneously on the face, neck, back of the forearms, and hands. The lesions were exactly of the same type as those of vesicular urticaria. They appeared first as a small red blotch about the size of the finger-nail with a central, slightly raised, rounded papule which rapidly developed into a vesicle about the size of a split-pea with clear or occasionally hæmorrhagic contents. In about twenty-four hours the vesicle broke and the lesion gradually involuted, leaving a purplish slightly pigmented patch from $\frac{1}{4}$ to $\frac{1}{2}$ in. in diameter, with an indefinite outline, but no pitting such as occurs in hydroa vacciniforme. In addition to the above situations a few lesions were present on the flexor aspect of the arms and on the palms of the hands. Lesions also occurred on the lips and inside the alæ nasi. Since that time lesions had been constantly coming out, a few every day. Recently they had been smaller in size and involuted more rapidly. The lesions were not preceded or accompanied by itching, and there was no factitious urticaria.

A physical examination failed to reveal any marked abnormality: the urine was normal; the blood showed slight eosinophilia (5 per cent).

The patient was put on a careful regime with regard to diet and an intestinal antiseptic treatment with distinct benefit.

The precise category in which the case should be placed was difficult to decide. It seemed from its distribution to be most probably a variant of the erythema multiforme group and due to some form of auto-intoxication. There was no grouping of the lesions to suggest dermatitis herpetiformis, nor was the itching sufficient.

The absence of cicatrices and the existence of lesions in covered places like the forearms argued against hydroa vacciniforme.

DISCUSSION.

The PRESIDENT expressed his obligations to Dr. MacLeod for bringing the case forward, as he regarded it of considerable practical importance, all dermatologists having doubtless met with precisely identical cases, especially in private practice. He sympathized with the exhibitor in his dilemma as to nomenclature. He entered them in his personal case-books as "vesicating urticaria," although many did not itch. He associated them, as Dr. MacLeod did, with intestinal toxæmia; and more than once he had seen benefit follow treatment on the same lines as for cases of "colitis." Many of these patients exhibited factitious urticaria in a remarkable degree. Still, he was quite dissatisfied with his own name for them, which he only used as a label.

Dr. PERNET regarded this kind of case as one which could not always be definitely pigeon-holed; it was on the borderline of a variety of conditions which Dr. MacLeod had mentioned. One should fall back on Dr. Brocq's fascinating diagrams, and place these cases somewhere between the circles.

Dr. ALFRED EDDOWES said he had seen many cases of urticaria papulosa become complicated by infection; and in these cases he had learned to look for streptococci and *Staphylococcus albus*. The last named was very lively in hot weather, and a child in the country would not have the same chance of contracting the infection as on coming into a crowded city. He had seen almost an epidemic of impetigo in children resident in London mews.

Dr. MACLEOD replied that he did not think that Dr. Eddowes's suggestion was tenable, as the lesions, in their appearance and evolution, were like those of vesicating urticaria and not impetigo, and they were not infective.

Case of Mycosis Fungoides.

By HALDIN DAVIS, F.R.C.S.

THE case was that of a patient who had been shown previously at the meeting of the Section held on April 17, 1913,¹ at which the exhibitor had suggested the same diagnosis. At that meeting the case had given rise to considerable discussion and alternative diagnoses had been put forward by other members. The patient, a woman, aged 56, who had suffered from a universal scaly dermatitis for about three years, was now shown again in order that the Section might have an opportunity of noticing the changes which had occurred in the last six months. The most noticeable alterations were (1) that the infiltration which had affected the left side of the face had almost disappeared; in fact a few weeks before the meeting the face was quite clear, but it had now again become somewhat infiltrated on the side of the nose near the inner canthus; (2) that on the scalp which had on the former occasion been almost totally bald, a considerable quantity of fresh, fine white hair had grown; (3) that the dermatitis itself had diminished considerably, although undoubtedly still present. Since the first time the case had been shown the exhibitor had had the blood examined both for the Wassermann reaction and for abnormality in the blood cells. In both points the result of the examination was negative. The only treatment which the patient had had was 5 minims of arsenic three times a day and the external application of liquid paraffin. She had not had photo-therapy, radiotherapy, or even vaccines. Nevertheless the exhibitor still held to his previous diagnosis.

DISCUSSION.

Dr. PERNET said that when Dr. Davis showed the patient before, he regarded it as the pre-mycotic stage of mycosis fungoides, and that was still his view.

The PRESIDENT said he had observed one case of what proved ultimately and indubitably to be mycosis fungoides, which cleared up completely for some time under massive doses of arsenic, but subsequently recurred and proved fatal. He had never seen a pre-mycotic eruption exactly identical with that presented by the patient exhibited; it certainly lacked the objective characters of the cases seen in abundance at the St. Louis Hospital, and there classified as "*hommes ou femmes rouges*." He dared not venture upon a diagnosis.

¹ *Proceedings*, 1913, vi, p. 126.

Case of Keratosis Follicularis Spinulosa.

By J. L. BUNCH, M.D.

THE patient was a child, aged 2, on whose scalp and eyebrows no hair had at any time grown except a number of stumps, darkly pigmented, and $\frac{1}{8}$ in. long. Round each pilo-sebaceous orifice was well-marked keratosis, and to the touch the surfaces gave the sensation of a nutmeg-grater surmounted by very small bristles. No redness or hyperæmia was present, the disease gave rise to no apparent subjective sensations, and the child seemed to be otherwise in good health. Microscopically, no fungus was present in the hairs. A younger sister had a good crop of healthy hair. The name *keratosis follicularis spinulosa* was given to the disease by Unna, and appeared preferable to the name *keratosis pilaris*.

Case of Xantho-erythrodermia Perstans.

By J. L. BUNCH, M.D.

THE patient was a man, aged 28, who had for some years suffered from pinkish-yellow, slightly scaly, slightly infiltrated patches on both legs and thighs. The patches first commenced on the right leg below the knee, later on the left leg, and had gradually spread until there were a number of similar patches on both legs and thighs. The patches varied in size from 1 in. by $\frac{1}{2}$ in. to the size of the palm of a hand, were irregular in outline, but in most cases sharply defined. By daylight the yellowish tint was very appreciable and predominated over the pinkish tinge which showed by artificial light. There was very little itching, and no other subjective symptoms. The patient was apparently healthy, and there was no family history of any similar disease.

The patient had previously been under treatment elsewhere, and the right leg had had three exposures to X-rays without any appreciable benefit, and other local treatment did not seem to have caused any improvement in the lesions. This, of course, corresponded with the results obtained in similar cases, which were notoriously resistant to treatment.

Sections showed scarcely any infiltration of the derma, but infiltration of the epidermis, flattening of the papillæ, and almost complete absence of the stratum granulosum.

The first similar case was reported by Unna under the name of *parakeratosis variegata*, and here only the papillary layer and epidermis were affected. Brocq's *érythrodermie pityriasique en plaques disséminées* appears to be a name for the same disease, and Brocq's cases are presumably the same as the one now recorded under the name which Radcliffe Crocker gave to the disease.

DISCUSSION.

Dr. CORBETT said the case was shown at the International Medical Congress by Dr. Stainer and himself. Various diagnoses were made, one of which was the para-psoriasis of Brocq, another was parakeratosis variegata, and another was early mycosis. One leg had since been X-rayed three times, but without benefit. An excised piece of skin showed only chronic inflammation.

Dr. PERNET considered this was a case of what he had named *pro tem.* xantho-erythrodermia perstans. He would like to know if the histology corresponded with what he (Dr. Pernet¹) had described.

The PRESIDENT concurred fully in Dr. Bunch's diagnosis, but, unfortunately, the name did not carry one far. Perhaps investigation of this case would give more information about the condition than exists at present.

Severe Secondary Syphilitic Rash in a Woman, aged 70.

By G. PERNET, M.D.

WHEN seen, the patient was suffering from a very florid secondary rash, with much rawness and fissuring at the angles of the mouth. As she had not made any progress on mist. hydrarg. biniodidi, ordered by one of his clinical assistants, Dr. Pernet put her on hydrarg. cum creta until a bed was ready for her to try neo-salvarsan in small doses. She had improved very rapidly on the hydrarg. cum creta.

¹ *Brit. Journ. Derm.*, 1905, xvii, p. 134.

Permanent Alopecia following X-ray Treatment for Tinea Tonsurans.

By G. PERNET, M.D.

THE patient was a little girl who had been X-rayed elsewhere two years previously. As there were a few small crusted lesions, Dr. Pernet ordered ung. hydrarg. ammon. dil., and the mother was sure some of the hairs had grown since. A few stray hairs were now to be seen.

Case of Secondary Syphilitic Patchy Alopecia.

By G. PERNET, M.D.

THE patient, a young woman, aged 25, came to the West London Hospital for areas of alopecia. They were irregular and completely denuded. Dr. Pernet diagnosed the case as syphilis, and on investigation, adenitis, a roseola, &c., were found. She had had an injection of neo-salvarsan (intravenous) followed by grey oil, and was greatly improved in her general health.

Dr. PERNET showed a *case of generalized diffuse nævus*. The patient was an undersized boy, aged 9, with a diffuse vascular nævus involving the greater part of the body, especially the left side.

Dr. DORE (for Dr. Winkelried Williams) showed a *case of linear atrophy* in a young man. The lesions chiefly affected the arms and had been present for two years. The patient stated that the linear scars which were now white had previously been red in colour. There was no history of typhoid fever or other predisposing cause.

Dermatological Section.

November 20, 1913.

Dr. J. J. PRINGLE, President of the Section, in the Chair.

Case for Diagnosis (Unusual Lupus Erythematosus).

By Sir MALCOLM MORRIS, K.C.V.O., and S. E. DORE, M.D.

THE patient, a man, aged 57, has suffered severely from gout and has passed a large quantity of gravel in recent years. His skin disease dates from April, 1912, when he noticed a small red patch on the back of the left hand, followed a fortnight later by a similar patch on the right hand. After about two months the face and the back of the neck became affected, and the diagnosis of eczema was made. He then went to Harrogate where various methods of treatment were tried without success. The condition was then diagnosed as lupus erythematosus and he was treated with large doses of salicin for a period of eight months. This treatment was followed by some improvement of the eruption on the hands. In April of the present year Sir Malcolm Morris prescribed mercury and potassium iodide and the patient underwent a further improvement. His blood gave a negative Wassermann reaction.

Present state: The eruption is situated on the face, forehead, ears, and on both sides of the back of the neck. There are also numerous patches on the back of the hands and the patient states that his feet have been affected but the lesions have disappeared. On the left elbow there is a small scaly patch indistinguishable from psoriasis; the skin of the opposite elbow and of the knees is healthy. There are also some patches of an indeterminate nature in the groins and on the scrotum, and three

small patches on the chest. The eruption is most acute on the sides of the neck where there are large confluent, slightly raised areas of a dark red colour with small intervening areas showing superficial scarring. Both cheeks are extensively affected, the skin being also covered with telangiectases. On the forehead above the left eyebrow there is a small isolated circinate patch. The skin of the ears is red, scaly and atrophied. The dorsal surfaces of the hands and fingers show deep red or bluish, slightly scaly patches with a tendency to central involution and the formation of rings or segments of circles. In addition to the lesions on the skin there are patches like leukoplakia on the tongue and right buccal mucous membrane on the right side.

The distribution of the lesions on the cheeks, ears and dorsal surfaces of the hands and fingers, their peculiar colour and method of evolution, and the presence of superficial scarring, strongly suggest the diagnosis of lupus erythematosus. On the other hand, the presence of itching and the peculiar situation and characters of some of the lesions and the patches on the tongue are unlike anything commonly seen in that disease.

DISCUSSION.

Dr. PERNET said the patient had been under his care and the diagnosis he made was lupus erythematosus : he adhered to that diagnosis. When the patient came to him the face was acutely and symmetrically involved, as also the hands, which were very swollen, including the palmar aspects. The patient had improved considerably under his care.

The PRESIDENT (Dr. J. J. Pringle) said that although he concurred in the diagnosis of lupus erythematosus as regards the lesions of the face and hands, he thought those in the groins and elsewhere were probably seborrhœic psoriasis. He had seen the case once in private and then was greatly puzzled by it. A reference to his private notes made subsequently to the meeting confirmed the opinion expressed above. In them it was stated that the manifestations first appeared in 1893 on the legs, arms, and scalp.

Multiple Lupus Vulgaris in an Adult simulating Lupus Erythematosus.

By H. G. ADAMSON, M.D.

THIS case was shown at the meeting of the Section on July 17, 1913,¹ as one of lupus erythematosus of the face with lupus vulgaris of the abdomen. Different opinions were expressed as to the diagnosis. Dr. Pringle regarded the case as an example of the "nodular type" of erythematous lupus of Radcliffe Crocker, "which was in reality a distinctly tubercular disease." Others suggested the diagnosis of mycosis fungoides.

Since the exhibition of the case in July the patches on the face have gradually changed their character. The diffuse dusky redness has cleared up, revealing small reddish-brown nodules—typical "apple-jelly" lupus nodules. A microscopical examination of a piece of tissue both from a patch on the forehead and from a patch on the abdomen shows typical "tubercles," with giant cells, plasma cells and epithelioid cells. The appearances are quite unlike those of lupus erythematosus. The alternative diagnosis of lupus pernio was suggested by the exhibitor at the last meeting, and it may be remarked that the patches do resemble lupus pernio in the presence of a diffuse redness which in the earlier stages marks the lupus nodules and in the multiplicity and rapid onset of the lesions; but they differ from the lesions of lupus pernio in that they do not attack the extremities.

The case is particularly interesting because it shows that lupus vulgaris may imitate lupus erythematosus, and it suggests that those exceptional cases of supposed lupus erythematosus which have been claimed as tuberculous may be imitations. There has been a marked improvement under treatment by X-ray applications combined with the use of salicylic acid plaster-mull. A von Pirquet reaction was strongly positive; a Wassermann negative.

The PRESIDENT said he remembered the case being shown at the July meeting of the Section. The general impression then was that the lesions on the abdomen were undoubtedly lupus vulgaris, and that there was some doubt as to their nature on the face, which he personally thought to be frankly tuberculous. The remarkable improvement which had taken place under treatment confirming that opinion had quite cleared up the diagnosis, and Dr. Adamson deserved special thanks for bringing the case again before the Section.

¹ *Brit. Journ. Derm.*, 1913, xiii, p. 255, and *Proceedings*, 1913, vi, p. 181.

Case of Mycosis Fungoides.

By H. G. ADAMSON, M.D.

MRS. H. H., aged 65. There had been no skin trouble until three or four years ago. The eruption began as red patches on the face and these were soon followed by patches on the body. The red patches then began to scale, at first "like flour," afterwards in large flakes. She lost her husband eighteen months ago and the eruption has spread more rapidly since then until now it is present in every part of the skin. Her general health has been good. There has been a little itching over the shoulders, but not much, and there is none now. Ten years ago her left eye was removed for some disease "at the back of the eye."

The present eruption consists of sharply circumscribed, dusky red, slightly raised and scaling patches. Some patches are disk-like, others in circles, and others roughly crescentic. They vary in size from $\frac{1}{2}$ in. across to several inches, and they are so numerous that they are almost touching and leave only about half of the whole skin surface free. They are present on the scalp, face, neck, trunk, limbs, palms and soles—in fact, everywhere on the skin surface. The superficial appearance of the patches is somewhat that of psoriasis, but they differ from psoriasis patches in that they are slightly raised and distinctly infiltrated, so that they feel two or three times the thickness of the normal skin when pinched up. The surface of the patches is smooth and glossy under the scales, but some patches are excoriated and some on the shoulders and buttocks are ulcerated and crusted. Over the joints of the fingers and knees and elbows the patches are transversely fissured.

There are no large projecting tumours. The hair is scanty. The nails are normal. There is a general enlargement of the glands, and they may be felt enlarged, especially in the neck, in the groins and above the elbow. The urine is normal. The temperature is normal.

A blood examination gave the following results (September 21, 1913). Red cells, 3,520,000 per cubic millimetre; hæmoglobin, 63 per cent.; colour index, 0.35; leucocytes, 7,000 per cubic millimetre; polymorphonuclears, 4,410 per cubic millimetre (63 per cent.); lymphocytes, 1,960 per cubic millimetre (28 per cent.); large mononuclears, 280 per cubic millimetre (4 per cent.); eosinophiles, 280 per cubic millimetre

(4 per cent.); basophiles, 70 per cubic millimetre (1 per cent.). Slight anisocytosis. No abnormal cells.

The condition has rapidly improved under treatment by X-rays, but the patient has lost weight. She does not take her food so well in hospital as at home.

Microscopical examination of sections from patches on the arm: (a) Epidermis—There is parakeratosis in the form of a thick layer of swollen nucleated horny cells. There is marked acanthosis, the prickle cell layer being considerably widened and throwing long, irregular prolongations into the corium. (b) Corium—The papillæ are enormously enlarged. A cell infiltration extends from the apices of the papillæ to half-way towards the sweat-glands. The infiltration is made up of lymphocytes, plasma cells and epithelioid cells. There are also numerous mast cells and large masses of pigment, both confined to the lower margin of the infiltration. The proportion of the three elements of the cell infiltration varies in different parts. In some parts there are "epithelioid" cells and numerous dilated capillaries. In others there is a mixture of epithelioid cells, plasma cells, and lymphocytes. In all parts of the infiltration and even in the corium between the infiltration and the sweat-gland level, there are numerous dilated capillaries with proliferated wall cells, some of which in cross-section give the appearance of giant cells. But there are no typical giant cells. On the whole the microscopical findings are those of an inflammatory cell infiltration in the corium (a granuloma), with marked new formation of capillary vessels, with mast cells, and with deposit of pigment. The epidermis shares in the inflammatory reaction.

DISCUSSION.

Dr. D. VINRACE asked for information as to the frequency of application of X-ray treatment in such cases.

The PRESIDENT said he had a patient with mycosis fungoides now under his observation who had been X-rayed at irregular but very short intervals during the last fifteen years; whenever a suspicious patch appeared he at once came to hospital for further treatment. The disease was thereby controlled and kept in abeyance but not cured.

Dr. DORE said he had had two such cases under his care recently, and he had been obliged to repeat the exposures of X-rays frequently, on account of the large extent and rapid progress of the disease. It was inadvisable to limit the action of the rays to each affected area, because commencing lesions might exist under apparently healthy skin.

Case for Diagnosis (Adult Urticaria Pigmentosa).

By A. D. HEATH, M.D.

THE patient, a young medical man, had first noticed brown pigmented areas on his forearms when he was living in Natal two years ago. The spots were from $\frac{1}{16}$ to $\frac{1}{8}$ in. in diameter and they seemed to become slightly raised above the level of the skin when the affected parts were rubbed. The eruption chiefly affected the forearms, lower part of back and the thighs. The brown spots had slowly increased in number during the past eight months when the patient was resident in England.

DISCUSSION.

Dr. ADAMSON thought the eruption was urticaria pigmentosa. He had seen two similar cases of what appeared to be urticaria pigmentosa cases in adult life. The urticarial element was not prominent in either of these cases and only became evident on rubbing the skin, when the macules distinctly swelled up. Swelling of the macules could be brought about by friction in the present case. Both cases the speaker had seen were in private patients and it had not been possible to confirm the diagnosis by a biopsy and microscopical examination.

Dr. WHITFIELD doubted whether the case was one of urticaria pigmentosa. He had seen two similar cases and believed the disease was one *sui generis*. One could never get a biopsy of these cases. He did not think any one of the lesions disappeared. In one exactly similar case he had seen during the last year the man knew each lesion by sight, and would have known if one had disappeared.

Dr. EDDOWES said if there had been time he would have liked to see if the disease was connected with the hair-follicles or sweat-pores. He was not sure that the sweat-pores did not become infected as much as the follicles. He had recently watched many rashes which apparently began in the sweat apparatus, not in the follicles. When a case was advanced, that point was a difficult one to settle. In a recent case of acute eczema he found several sweat-pores contained organisms, producing here and there little opaque white blisters. He was able to obtain a culture from the contents ; apparently a pure *Staphylococcus albus*.

Dr. PERNET said he had seen urticaria pigmentosa in the adult. He remembered a young Jewish adult in whom the pigmentation was more marked than in this case, and in whom the lesions were larger. Still, one must allow for variations in all directions.

The PRESIDENT said his experience of the urticaria pigmentosa of adults was confined to two cases. One occurred in a soldier under the late Sir Stephen Mackenzie in the London Hospital and the other was a hospital nurse. There were several clinical points of difference from the classical urticaria pigmentosa of children in those two cases. The present patient had well-marked dermographism and the papules were suggestive of urticarial lesions. There was not much pigmentation, and what there was almost disappeared on diascopy. As far as he was aware the histology of adult urticaria pigmentosa had never been studied. He could see no grounds for accepting Dr. Eddowes's view that the condition was the result of invasion by staphylococci of either sweat-pores or hair-follicles. Possibly the patient would give permission for a biopsy and Dr. Heath would report on the microscopical findings.

Dr. HEATH replied that his provisional diagnosis was that it was an unusual case of urticaria pigmentosa.

Case of Mycosis Fungoides.

By J. J. PRINGLE, M.B.

THE patient was a married woman, aged 40, who was sent up from Aldershot and admitted to his skin ward in the Middlesex Hospital on July 18. Her family and previous personal history were unimportant. She was an intelligent person who gave the history of her ailment with lucidity. She had been married six years and had two children. After the birth of her last child in February, 1912, she had "puerperal fever" which lasted for three weeks, in the course of which a red rash developed on her chest. After cessation of the fever the rash increased in extent and became irritable. The eruption gradually invaded the whole body surface, except the face, and the scalp became scurfy. After the rash had been generalized for only a few weeks enlargement of glands was noted in the back of the neck, in the front of the neck, in the armpits and in the groins, the patient's attention being drawn to them by pain in these regions consecutively. She averred that the rash was at first patchy all over but that the patchiness had gradually been obliterated. The face had only been involved for four months, and the hair had fallen rapidly from the scalp and other normally hairy parts for only two months previous to admission, during which time the itching had diminished.

She had been submitted to various forms of treatment. In May, 1912, she consulted a practitioner who X-rayed her body twice a week for ten

months and gave her several injections of arsenic subcutaneously; she was given some injections of "mixed vaccines" at a homœopathic hospital in November, 1912, and May, 1913; she had also been in a nursing home for eleven weeks in 1913, where she had high frequency treatment and tar baths *inter alia*.

On admission the patient presented a vivid universal erythrodermia, the dorsal surfaces of the feet being the parts least involved. Over the whole trunk and limbs the redness was somewhat patchy, and there was a great deal of brown pigmentation suggestive of the administration of arsenic, or which might (more probably) have resulted from X-raying. The mottled or marbled appearance thus produced was marked on the face as well as on the trunk, but the mucous membranes were not involved. On and round about the ears there was some discharge and eczematization, while in the great flexures there was a little scaling. The palms and soles were thickened, cracked and scaly. The other parts of the trunk and limbs were covered by dry, harsh, lichenified and quadrillated skin, this condition being most marked over the abdomen. There was no hair on the scalp, in the axillæ, or over the pubic region, and the eyebrows and eyelashes were totally absent. Large masses of slightly tender glands were noted in the inguinal and axillary regions, as well as in the anterior and posterior triangles of the neck and in the pre-auricular and submaxillary regions. The spleen was enlarged and easily felt down to the level of the umbilicus. Two firm nodules about the size of a bean were detected by palpation, after careful examination, embedded in the skin of the left temporal region immediately outside the orbit and on the left side of the chest outside the nipple. Over the trunk some slightly raised, soft, flat-topped plaques were present, but none were present on the face or scalp. The urine contained a slight excess of indican but was otherwise normal; there was no evidence of disease of the heart or lungs. The tongue was clean, appetite good, and the patient in good spirits, complaining only of some weakness and lassitude.

In the first ten days of her stay in hospital the patient had a considerable degree, but quite irregular type, of fever, the temperature ranging as high as 103.2° F. Blood cultures proved to be sterile.

In the beginning of August several small circular ulcers appeared over the scalp and legs which were referred to the breaking down of dermic lumps not previously noted. They soon healed up after the discharge of some slough. During the exhibitor's absence from town, in the latter half of August and throughout September and October,

the patient was under the observation of his colleague, Dr. Voelcker. In the beginning of November, when the patient was retransferred, many marked changes from her previous condition were noted. Of these the most remarkable were the clearing up of much of the previous erythrodermia, especially over the face, forehead and scalp, and the growth of quite a remarkable quantity of hair over the pale areas on the scalp as well as of eyebrows and eyelashes. A large number of soft, small, infiltrated, raised patches had, however, appeared over the face, the head, scalp, trunk and limbs, while the lichenification of the skin of the abdomen was rather more marked than before. From September 10 to September 24 there was considerable fever, the temperature attaining nearly 102° F. at night, but it had since sunk to and remained fairly regularly about normal. The enlarged glandular masses in the groins and neck which had been X-rayed twice, on July 30 and August 17, had greatly diminished in size.

Careful blood counts had been made on nine occasions, but no definite conclusions could be drawn from them. The great lymphatic glandular enlargements with an enlarged spleen led to the expectation of the discovery of some leukæmia, but this had never been present. It was perhaps also worthy of note that since August 25, when arsenical medication was stopped—she was then taking 12 minims of liquor arsenicalis three times a day—the red corpuscles and leucocytes had slightly diminished in number and the lymphocytes had relatively decreased.

Dr. MacCormac reported on the microscopical appearances of a nodule excised from the arm as follows: "The section was made from a non-ulcerated nodule about the size of a sixpenny piece. There is well-marked downgrowth of the rete: œdema of this region is distinct in many places, and histological vesicles have been formed here and there, in some of which collections of cells have occurred. There is also distinct parakeratosis. A very definite cellular infiltration occurs in the papillary and sub-papillary layers. These cells are of an indeterminate character, are round, irregular, and oval in type, possibly corresponding to lymphocytes and fibroblasts; a very few, from the extent of their cytoplasm and their nuclear appearances, may possibly be plasmic cells."

Case of Epidermolysis Bullosa Congenita.

By DAVID WALSH, M.D.

THIS patient is a healthy-looking, well-nourished lad, aged 15, who comes from the Foundling Hospital and is shown by the courtesy of Dr. W. J. G. Swift. He presents the usual features of the affection—that is to say, he has been all his life subject to the formation of bullæ following traumatism. These are at times blood-stained. Attempts have been made to obtain cultures from the bullæ with various fluid and solid culture media, but results have been negative. Biopsies have also been made and slides are shown here to-day. The sections necessary for this purpose were carried well into the subcutaneous tissues, but all healed rapidly without complications. The future of this patient is the cause of anxiety to the authorities of the Foundling Hospital. It is their practice to place lads on reaching his age in some occupation at which they can earn their living. In this instance it seemed impossible to find any employment in which he will not be troubled owing to the state of the skin. Any suggestions of members upon this point and also as to treatment will be welcomed by Dr. Swift. X-rays have been recommended, but in view of the exaggerated reaction of the skin to traumatism the use of so potent an agent seems somewhat hazardous, and it is, moreover, not easy to see how any benefit is likely to result.

A further point of some interest is that according to the patient's statement bullæ have ceased to appear in the region of the nose, where they were formerly common.

The heart condition has not been noted by most of the observers who have reported cases of this disease. In a case recorded by Goldscheider it is expressly stated that the patient, a soldier, aged 22, had a "sound circulation." In Payne's first case (1882), mentioned by Wallace Beatty,¹ that of a delicate boy, aged 3½, it was stated that "rapidity of healing of the bullæ was an index of the boy's health" (p. 305). In one case reported by Valentin there was dermatographia, a condition which I found associated with valvular disease in one of Dr. Norman Meachen's patients.

One point that is specially interesting from my own point of view is

¹ *Brit. Journ. Derm.*, 1897, ix, p. 305.

the state of the circulation. It may be known to some of those present that I have elsewhere ascribed to a defective circulation an important rôle as a predisposing factor in many skin affections, more especially those of a chronic or recurrent nature. The defect may be central, that is to say, in the valves or myocardium of the heart, or it may be in the arteries, and so on. The skin manifestation under these circumstances I ascribe to an abnormal reaction to traumatism, due in some way to disturbance of the cutaneous circulatory balance. In the case of epidermolysis bullosa congenita we find the condition of reaction to traumatism in an exaggerated form. It is accordingly of interest to find that in the patient shown here to-day there is a history suggesting congenital morbus cordis. When first seen the patient's extremities were purple and congested and an examination of the heart showed an abnormality of the pulmonary sounds. This observation was confirmed by Dr. Swift, who referred to the early records of the lad and found a note of "blue hands." It would be of interest to note the cardiac condition in other cases of epidermolysis.

DISCUSSION.

Dr. WILFRID FOX said he would be glad to know if any member had seen a case in which the condition was acquired. He once saw a naval officer who apparently acquired the disease in his seventeenth year. It seemed quite clear that he had nothing of the kind as a child.

Dr. MACLEOD remarked, in reply to Dr. Wilfrid Fox, that there were a number of cases on record in which acantholysis, amounting in some cases to epidermolysis bullosa, had appeared in adult life, but these had developed as a late phase in connexion with pemphigus. With regard to the possible relation of morbus cordis and circulatory disturbances to the epidermolysis bullosa, he considered that their association was absolutely accidental.

Dr. BOLAM said that he had examined the boy's chest in the ante-room, and had not been able to discover any definite heart lesion.

Dr. F. PARKES WEBER said that as far as he could examine the boy, he did not consider that there was the slightest evidence of congenital or acquired valvular disease in the case. Even if a murmur over the pulmonary area could be heard, it was certainly, in itself, no proof of the presence of congenital heart disease. But if there had been congenital heart disease present its association with epidermolysis bullosa would probably have been a chance one, for in all the numerous published cases of congenital heart disease the presence of epidermolysis bullosa seemed never to have been noted, and vice-versâ in recorded cases of epidermolysis bullosa no mention seemed to have been made of the presence of congenital heart disease.

Dr. NIXON said there was a possible connexion between the epidermolysis bullosa and Raynaud's disease—i.e., the blue fingers and the vasomotor phenomena.

The PRESIDENT said he believed that low grades of epidermolysis bullosa were quite common. He knew several families in the members of which blisters were produced on the slightest provocation. Such families were in consequence notoriously debarred from playing many games.

Dr. WALSH replied, reminding members that he did not suggest anything but a chance association between the heart condition and the skin affection; but he gave reasons for attaching some interest to the heart lesions in this connexion. Not only was the question of the individual observer a factor, but also the question of the stethoscope used. He used a stethoscope, and he would be glad to lend that instrument of precision to those who doubted the existence of an abnormal sound after the boy had been given a little exercise. It was heard near the second left rib cartilage. He would like the matter to be submitted to two or three gentlemen of experience in heart cases.

The PRESIDENT said that in view of the extremely divergent views expressed by the various speakers as to the condition of the patient's heart he moved for the appointment of a small committee for investigation and report upon it. This was unanimously agreed to.

A New Radiometer for Sabouraud's Pastilles.

By DUDLEY CORBETT, M.D.

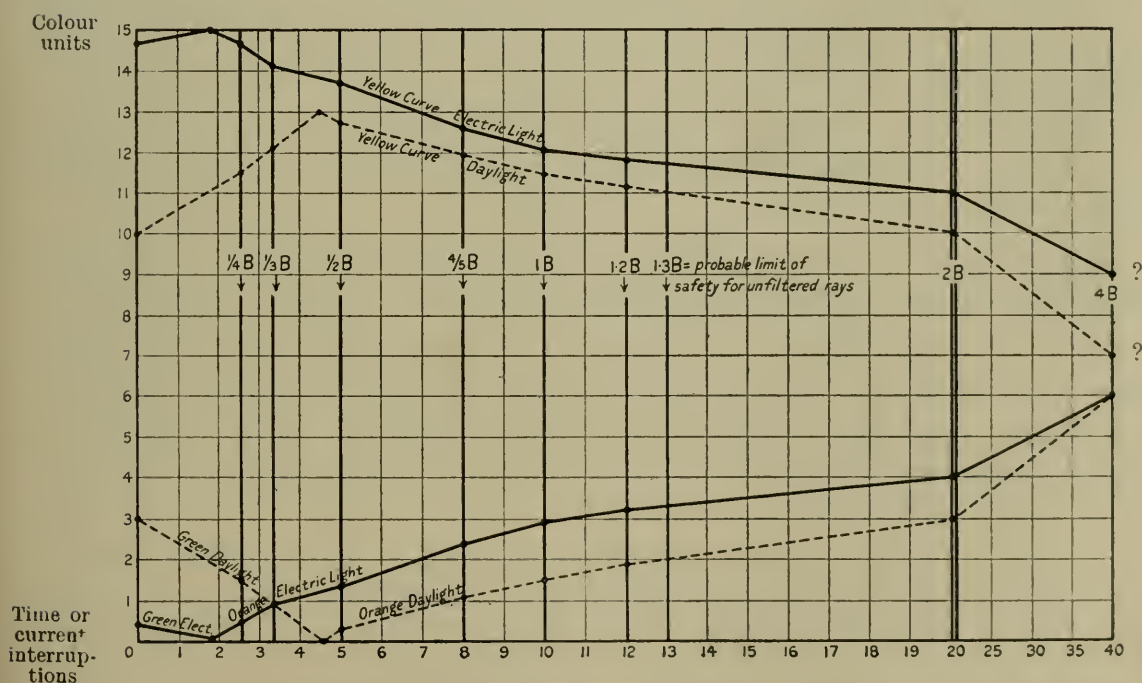
THIS radiometer is based on the results of experiments carried out on the colour changes occurring in the Sabouraud-Noiré pastille when exposed to X-rays. A summary of some of the observations was published in the *British Journal of Dermatology* for August, 1913.¹ It was also shown that many of the paper standards for tint B, which have been supplied in the past, differ considerably in their colour composition and have so led to difficulty and even to trouble.

In these experiments the pastille was measured directly after exposure to X-rays in the half-way position by means of a Lovibond's tintometer. This instrument consists of a series of finely graded standard glasses of the three primary colours, each standard being measured and its value determined spectroscopically. They can be inserted into a suitable viewing tube in such a way that by a combination of standards the colour of any given substance can be exactly

¹ *Brit. Journ. Derm.*, 1913, p. 249.

matched. Using a well-seasoned X-ray tube with dipper break and tachymeter, and keeping the milliamperemeter and qualimeter readings constant, it was possible to determine, by taking a series of cases, the number of interruptions required to produce satisfactory epilation without dermatitis; in other words, the tint B of Sabouraud was expressed in terms of current interruptions and its exact colour composition ascertained. Further, using the same tube for each series and by taking the average of a large number of observations with other tubes, it was possible to determine the colour composition of any fractional dose. In this way glass standards for any fractional dose up to 2 B have been fixed. These are viewed against a pure white background, in a suitable instrument, in such a way that the tint of the pastille can be compared with them by looking down the eyepiece. These standards have been worked out for daylight and for electric light from an 8-c.p. carbon filament lamp, the glass of which was obscured in the usual way. There was not a great deal of difference between the results obtained from this lamp and those from a low power obscured metal filament lamp, but it was more convenient to take the carbon filament lamp as standard.

The results are best shown graphically by curves:—



Curves representing colour developed by Sabouraud's pastille when exposed to X-rays in measured doses. Pastille fixed half-way between skin and anti-cathode. Ordinates = Lovibond colour units. Abscissa markings = Current interruptions or time, milliamperemeter and qualimeter readings constant. Fixed points determined by direct measurement, each being the average of a number of observations.

It is at once seen that the electric light standards have more yellow and orange than those for daylight. When measured to daylight, the pastille quickly loses its green colour, until at a point just below $\frac{1}{2}$ dose there is no colour present but yellow. Orange then rapidly develops, and it is this increase in the orange content that determines the differences between the larger doses. Under electric light there is only a trace of green in the unexposed pastille; this is quickly lost, to be replaced by orange, which increases at about the same rate as in daylight, but starting earlier reaches a higher mark at Tint B.¹

Precautions to be taken when using the radiometer:—

(A) *In Daylight*.—(1) This should be diffused and as white as possible, preferably north light. On no account should measurements be made near sunlight. (2) Keep the instrument vertical, avoiding shadows.

(B) *Electric Light*.—(1) Use an 8-c.p. carbon filament “obscured” lamp in good condition. (2) Keep the instrument vertical, the pastille being about 6 in. away from the lamp.

In both cases: (1) Examine as quickly as possible, for the pastille fades even in electric light. (2) When one is intending to reach tint B or $\frac{1}{1}$ dose, put up the $\frac{4}{5}$ standard first of all, then if this is matched it is easy to determine how much more is required to reach the full dose: in this way an overdose can be avoided with certainty. (3) The standard white background must always be used. The differences are rather better marked in daylight, but with a little practice in appreciating the orange increase it is quite easy to work with electric light.

The Epilation Dose.—Using a medium hard tube, $\frac{4}{5}$ B usually produces epilation without erythema, but cannot always be relied upon to do so. It is frequently insufficient for stiff beards and for the top patch in tinea work. $\frac{1}{1}$ or tint B always produces epilation together with some transitory erythema at about eighteen days. There is always regrowth of hair. $\frac{1}{2}$ B always produces epilation together

¹ An interesting point arose when measuring the unexposed pastille and the $\frac{1}{4}$ B and $\frac{1}{3}$ B to daylight. It was found that, although it was possible to match the pastille in tint, it was always brighter than standard. Mr. Lovibond tells me that this frequently occurs when the tintometer is used commercially. This brightness is dulled by the interposition of a standard neutral tint composed of a fraction or multiple of one unit of each of the red, yellow, and blue glasses combined together, which absorbs the white light reflected from the pastille. Thus the colour sensation transmitted from the unexposed pastille in daylight is: yellow, 11.5; green, 1.5; light, 1.5, for 1.5 of neutral tint was required to absorb all the white light transmitted. Similarly for $\frac{1}{4}$ B and $\frac{1}{3}$ B, 0.5 and 0.2 neutral tint were required respectively.

with marked erythema, and occasionally some transitory dermatitis on the unprotected skin of the nape of the neck and behind the ears. There is no dermatitis of the scalp proper, but there is a smart reaction round any septic foci that may be present. This form of dermatitis, which is little more than a desquamation, clears up in a week. In the few cases of tinea where this figure was reached the regrowth of hair was perfect. But it is probable that this point is very nearly the limit consistent with safety in tinea, and it is rarely necessary to go so far.

Fractional Doses.—When one examines the curves it is easy to see that standards for any fractional dose can be provided. The ones selected and specially estimated are those in common use for therapeutic work.

Old Pastilles.—A pastille that has once been exposed never returns exactly to its original tint; there is less green, even after thorough bleaching. This fact, however, as far as could be ascertained, makes practically no difference to the orange part of the curve, provided that the pastille has not been used more than two or three times at most and has been well bleached.

The instrument has been in daily use in the X-ray Therapeutic Department of St. Thomas's Hospital for some months and the results in tinea work have been most satisfactory. We use $\frac{4}{5}$ or $\frac{9}{10}$ B for all except the top patch, which receives the full dose.

The pastille should be examined in its holder. The instrument can be adapted to take any form of pastille holder. The makers are Tintometer, Ltd., The Colour Laboratory, Salisbury.

The advantages of this radiometer over others where Sabouraud's pastille is employed are:—

(1) The colour standards are constant, invariable in tint, easily kept clean, and do not fade.

(2) They have all been verified experimentally in tinea work, and any fractional or multiple dose can be standardized.

(3) There is provision of a separate series for daylight and standard artificial light. A series could be worked out for any constant source of light if required.

DISCUSSION.

Dr. WHITFIELD said that he considered the instrument of great value. One knew the difficulty, especially at this time of year, in doing ringworm cases in the afternoon, when the light was so uncertain; and if it was foggy one was unable to read the pastille. His experience was that none of the standards which were supposed to work with artificial light were reliable. Moreover, every time he got a new book there was some difference in the tints, and the books got dirty. Dr. Corbett's apparatus was remarkably easy to read accurately.

Dr. MACLEOD said that he had had an opportunity of thoroughly examining the instrument, and considered it would be of distinct value in the therapeutic dosage of X-rays, both for the standardization of the tint B in Sabouraud's radiometer and for the recognition of the tint B in artificial light and the estimation of fractional dosages.

Dr. SEQUEIRA desired to add his word of appreciation, because standardization had become exceedingly important, especially in the wider use of the rays in ringworm. By an adaptation of this radiometer he believed four, five and six or more pastille doses could be given accurately, a great advantage in the administration of massive doses as was now common for malignant disease. With regard to the remarks concerning artificial light, he was accustomed to work his department entirely with the blinds drawn, the artificial light being tinted to exaggerate slightly the Sabouraud colours. He heartily welcomed the instrument, and congratulated Dr. Corbett on the success of his researches.

Dr. AGNES SAVILL asked whether this new pastille measure could be used on the skin. She always worked with two pastilles, one on the skin, one at half-way distance. It was very useful to work with a pastille on the skin, so that if the patient moved away from the pegs or other focus, one still had the control register on the skin.

Dr. CORBETT replied to Dr. Savill's question in the affirmative. When a pastille in the usual half-way position reached the full B tint a pastille on the skin would measure $1/4$ B. A standard was provided for this.

The PRESIDENT congratulated Dr. Corbett on the apparatus, which was obviously of great utility, and on the success others had obtained with it.

Case of Psoriasis in a very Young Infant.

By HALDIN DAVIS, F.R.C.S.

THIS patient is a healthy and thriving infant, now at the time of exhibition about 8 weeks old. The eruption which makes it a subject of interest appeared at the age of 1 month. A very large proportion of its entire body surface is covered with a figured erythema with scarcely any induration, but with a scaly surface. Where the erythema is limited by healthy skin it shows a circinate outline, suggesting the coalescence of circular patches. The face is involved and so also is the scalp, which when the patient was first seen was covered with a thick adherent crust. Most of the surface of the body and limbs is covered, but the extensor aspect is more affected than the flexor, although the exact points of the elbows and knees are not especially attacked. On the buttocks the eruption is complicated by the presence of a certain amount of napkin erythema. The diagnosis in this case lies between psoriasis and syphilis, but the latter is excluded by the following considerations:—

(1) The baby is perfectly well although it has had no anti-syphilitic treatment.

(2) There are no other signs suggestive of syphilis.

(3) It is the youngest of four children, the ages of the others being respectively 11, 7 and 4. All of them are healthy, and the mother has had no miscarriages.

(4) The Wassermann reaction, both in the mother and child, is negative.

It is interesting to note that there is no history, as far as can be ascertained, of psoriasis in the family. In most other cases of psoriasis in early infancy there has been strong evidence of heredity.

DISCUSSION.

Dr. MACLEOD said that he considered that the case was one of the so-called seborrhœic dermatitis rather than psoriasis. Some years ago he had shown an infant, aged 4 months, at the Dermatological Society of London with the diagnosis of psoriasis, in which the lesions were singularly psoriasiform. The eruption had cleared up subsequently with great rapidity under salicylic acid and sulphur applications and, as far as he was aware, had not recurred. He

came to the conclusion then that his original diagnosis was erroneous and that the affection was a local condition. The case shown by Dr. Haldin Davis was very similar in type.

Dr. WHITFIELD asked whether Dr. Davis had made a histological examination of the scales for micro-organisms. One might say that psoriasis never showed organisms, whereas seborrhœic dermatitis showed a quantity of organisms.

Dr. ADAMSON did not regard the case as one of psoriasis, but as so-called "seborrhœic dermatitis." He had described this condition in babies in a paper on "Napkin-region Eruptions in Infants" in the *British Journal of Dermatology* (February, 1909, xxi, p. 37), and also in the *St. Bartholomew's Hospital Journal* (May, 1906, xiii, No. 8, p. 119), and in the *British Journal of Children's Diseases* (June, 1908). It had been the subject of a thesis by Dr. Lebard in 1905 ("Sur un type d'érythème fessier évoluant chez les nourrissons atteints d'eczéma séborrhéique"). It was not to be confused with the "erythema of Jacquet" of the napkin region, which attacked the convex surfaces where these were rubbed with the napkin. The "seborrhœic eczema" involved both flexures and convex surfaces, was probably micrococcal in origin, and was rapidly cured by mild sulphur ointments.

Dr. DORE said that in his experience psoriasis in young children responded to treatment more readily than psoriasis in the adult; a weak sulphur or salicylic acid ointment was often sufficient to remove the eruption and sometimes there was no relapse. This pointed to the fact that some of these cases were seborrhœic dermatitis rather than psoriasis.

Dr. HALDIN DAVIS replied that he had not examined the scales, but he would do so, and report the result. The improvement in the child as compared with the condition a fortnight ago was very remarkable. A fortnight ago the redness and scaliness all over were very marked. If the child had been older he would not have had any doubt of the diagnosis, but he thought the only real criterion was to wait for a year or so and see if the condition returned. If it did not, he would confess he was wrong.

Case of Dermatitis Artefacta.

By GEORGE PERNET, M.D.

THE patient, a girl, aged 16, was first seen on November 11, when the following notes were made: Duration, eight weeks. Started on inner side of the left clavicle as four patches, leaving a certain amount of pigmentation. A fresh patch appeared a fortnight previously. It is a crusted lesion of irregular outline. Close to this there is a smaller

patch, irregularly quadrilateral. Scattered about the centre of the chest are a number of more or less circular crusted patches, rather close together; others are irregularly quadrilateral and linear. Over the right shoulder is an irregular polygonal patch. Two, more or less circular, on the left breast; also had two patches on the upper part of the back three weeks previously. These have left superficial scarring. Has had various ointments and also iodine. The last application of iodine was done in way of treatment on the day before. On November 18 four fresh lesions had occurred, two days after the patient was last seen. These were over the left breast and were close together. Two other smaller patches just above right clavicle about the size of a sixpenny piece with excoriated crusted centres, irregularly rounded. These fresh patches had not been treated with iodine.

Case of Tuberculides.

By J. H. SEQUEIRA, M.D.

THE patient, a girl, aged 22, gave the following history: Seven years ago she had a septic wound of the leg which took three months to heal. A few months later she developed tuberculous glands in the neck, and about the same time a number of red spots appeared on the fingers, forearms, and backs of the ankles and fronts of the legs. The lesion upon the fingers resembled chilblains at first but later they broke down and discharged for several months. She had never been free from the spots, but during the summer months they had been much fewer and the discharging lesions healed up. She had had a course of tuberculin for three years and a half at a general hospital in London, but there had been no improvement in the condition. The patient has had no other illnesses, and her family history is free from tuberculosis.

The lesions were in all stages, the earliest being an indurated red papule, the size of a small pea, the next stage a purplish hemispherical swelling with a central depression, the third stage was pustulation, which was present in numerous instances. The lesions sometimes aborted before reaching the pustular stage. The final conditions were represented by purplish depressed scars and old white depressed cicatrices. The eruption was scattered over the backs of the fingers, the wrists and the outer surfaces of the forearms, and the legs and buttocks. On the lower extremities there were some larger lesions,

some as large as a sixpenny piece in diameter, and in appearance and course these resembled Bazin's erythema induratum. The case having recently come under observation Dr. Sequeira could not report upon the histology or bacteriology. The glands in the neck and left axilla were enlarged.

DISCUSSION.

The PRESIDENT said the case was an extremely typical, although severe, example of the condition. He invited an expression of the experience of others as to the efficacy or otherwise of tuberculin in these cases. His own results with it had been, on the whole, disappointing.

Dr. WHITFIELD said he never gave tuberculin in cases of widespread tuberculides, it would be too risky, seeing that such patients were inoculating themselves with tuberculin. But he sometimes gave it very cautiously in Bazin's disease, as it healed up the ulceration.

Dr. MACLEOD thought it would be of special interest if Dr. Sequeira could obtain a biopsy in the case for microscopical examination, and also for inoculation purposes, and report to a subsequent meeting, in view of the fact that several observers had found tubercle bacilli in lesions of this type, and the opinion was gaining ground that they were frankly tuberculous and not toxid-tuberculides in the French sense of the term.

Dr. SEQUEIRA replied that the patient was now in hospital, and he would have a biopsy done, and also the inoculation of a guinea-pig.

Case of (?) Lichen Verrucosus.

By J. H. SEQUEIRA, M.D.

THE patient, who was sent to Dr. Sequeira by Dr. Growse and Dr. Asplen, of Kenilworth, was a farm labourer, aged 43.* He had had no serious illness, and his family history was unimportant. About five years ago a spot appeared upon the dorsum of the right hand, apparently as the result of an abrasion of the skin. Other spots appeared shortly afterwards, and in each case the patient believed that their appearance was preceded by an abrasion, but it is quite possible that the presence of the lesion may have led to the abrasion. The eruption began with the formation of small warty swellings which increased in size to form button-like excrescences. The lesions have disappeared completely except for a bluish discoloration on two occasions—viz., three years

ago and also fifteen months ago. This point in the history was verified by Dr. Loxton, of Birmingham, under whose care the patient had also been.

The eruption was of a very unusual character. On the backs of both hands in the region of the metacarpo-phalangeal joints and over the first interphalangeal articulations there were flat, button-like plaques varying in size from a sixpence to a shilling. The surface was rough and warty, and of a greyish-brown to bluish-brown colour. The lesions were freely movable over the subjacent tissues, and felt hard to the touch. There were similar rather smaller lesions on the elbows. Below the knees the rough, warty surface was absent, the plaques having a purplish colour, suggestive of lichen planus, the surface being perfectly smooth. There were other plaques on the ankles, over the malleoli and over the tendo Achillis. On the right foot the plaque on the internal malleolus appeared to be in process of involution. At the base of the first metatarsal there was a bluish cicatrix the site of a previous lesion. There was no evidence of visceral disease and the mucous membrane showed no abnormality.

The case will be further investigated, only a hurried section having been made of one of the nodules removed. This showed a somewhat severe inflammatory process in the dermis with much increase of the corneous layer of the epidermis. Suggesting the name lichen verrucosus, the exhibitor mentioned that there was a large type of lesion of this variety which many doubted being a true lichen planus. The appearance of the non-warty plaques on the knees certainly suggested lichen planus.

DISCUSSION.

The PRESIDENT remarked that had he seen the legs alone he might have shared Dr. Sequeira's opinion as to the diagnosis, but the condition of the hands left him in grave doubt. The history of the case, as observed by some Fellows present, might throw light on the diagnosis. A complete histological examination might also help.

Dr. ADAMSON said that the case was in his opinion one of erythema multiforme with unusually persistent lesions. The distribution on the backs of the hands and knees was characteristic, so were the recurrent attacks, and the lesions were disk-like with a tendency to ring formation at the margin. The scaling he thought was due to peeling off of the upper layers of the epidermis, in fact, a heavy desquamation and not true hyperkeratosis. The

case very closely resembled one shown twice by Dr. Graham Little.¹ Dr. A. M. H. Gray also exhibited a similar case under the title "Persistent Erythematous Eruption."² In the two cases referred to the diagnosis of erythema multiforme made by the speaker had been agreed to by several members then present.

Dr. HEATH said the case was shown at a medical society in Birmingham two or three years ago, and the lesions then were more erythematous than now. The Sister at the hospital where the patient was said the elevations became much more prominent in the evening and faded during the day. His view then was that they were discoid erythematous lesions on the backs of the hands, and they did not then show the thick horny scales which were now present.

Dr. GRAY noted that the lesions on the knees disappeared and left distinct atrophy. The case seemed like one shown by him before the Section a few months ago, and at the International Congress. The main difference was that his own case was much more acute; the lesions on the hands had blistered, but there was a similarity with regard to distribution and character. When he brought his own case the lesions had existed nine months. It also reminded him of a case in a child, aged 7, with chronic erythematous lesions with marked horny thickening over the knuckles; these were associated with very marked rheumatic nodules about the elbow and on the fingers. Rapid improvement occurred under salicylate of soda internally and the local application of salicylic acid. He had suggested the diagnosis of erythema elevatum diutinum in both these cases.

Dr. WHITFIELD agreed that the condition on the knees looked like lichen planus, but on the hand there could be seen an early lesion appearing and this did not look like lichen planus. Later lesions might be so altered as to look like lichen hypertrophicus.

Case of Syphilis showing Noguchi's Luetin Reaction.

By J. H. SEQUEIRA, M.D., and PAUL FILDES, M.B.

THE patient was a man, aged 60, who had a gummatous ulcer of the palate and leukoplakia of the tongue. The luetin was injected twenty-eight hours before the meeting. The reaction took the form of an inflammatory bright red papule about $\frac{1}{8}$ in. in diameter, and raised slightly above the surface. There was a small zone of erythema

¹ *Brit. Journ. of Derm.*, 1912, xxiv, pp. 119, 270.

² *Brit. Journ. of Derm.*, 1913, xxv, p. 162.

around the lesion. Dr. Sequeira mentioned that about fifty cases had been injected with luetin at the London Hospital. The reaction was found to correspond with the Wassermann reaction except in one instance. In this case there had been negative Wassermann reaction, while luetin gave a modified response. The suspected lesion had reacted rapidly to antisyphilitic treatment. The reaction of Noguchi, being an anaphylactic phenomenon, was not obtained in cases of florid secondary syphilis.

DISCUSSION.

The PRESIDENT said it had been reported to him by a skilled bacteriologist that the luetin reaction was inconstant and unreliable.

Mr. MACDONAGH said he had used luetin in several cases in all stages of syphilis, and found it was not of much use in the primary and secondary stages, though it was good in the tertiary stage. Occasionally a positive reaction had been obtained in patients who had never had syphilis; therefore luetin could not be regarded as having a specific action. Furthermore, positive cuti-reactions in cases of syphilis could be obtained with many other substances. Last of all, a positive reaction did not necessarily mean that the patient had active syphilis, only that he had had syphilis; therefore, treatment could not be regulated thereby.

Case of Xanthoma Tuberosum.

By A. WHITFIELD, M.D.

THE patient was a married woman, aged 53. Her statement was that two and a half years ago she began to develop freckles on the forearms. There was a rather large number of not very conspicuous freckles on both forearms, but the patient was quite clear that she did not have them until the time mentioned. Two years ago she noticed the little lumps coming on her elbows, the right elbow being the first to become affected. There was no history of the disease, as far as she knew, in any members of her family and there was no special history of any ill-health in the patient. The right elbow showed an irregular patch of xanthoma about $1\frac{1}{4}$ in. long and $\frac{3}{4}$ in. wide situated over the olecranon process. The patch might be easily seen to be made up of nodules about the size of a hemp-seed, and surrounding this patch was

a number of discrete nodules of various size. The left elbow was similarly affected but to a smaller extent. The nodules were of the usual canary yellow colour with a faint red areola around them. There was no apparent enlargement of the liver or obvious disease of any organ, but as the patient had been only seen on one occasion a specimen of the urine had not been obtained. Dr. Whitfield did not, however, expect to find any glycosuria, partly because the patient looked and felt so well and chiefly because of the very slight redness accompanying the yellow nodule formation.

A specimen of the urine was subsequently examined and contained no sugar or albumin.

Case of Lupus Erythematosus.

By ALFRED EDDOWES, M.D.

GIRL, aged 14, just left school. The disease commenced two years ago. Patient was a mouth-breather—not so now, since a recent operation upon tonsils and for adenoids. Strong history of tuberculosis in family, on both father's and mother's side. The disease upon the face is œdematous and rather acute, but of no special interest. The state of scalp is specially interesting. Her mother says, "Little red bumps form—remain red and tender for a time, then the hair falls and leaves a bald patch. A red spreading margin forms, and as it advances the hair falls, while the hair soon grows again in the centre of each patch."

The condition can still be studied. No local treatment is being employed. There are no stumps such as occur in alopecia areata. It is interesting to observe that when the hair, which is naturally auburn, regrows, it is black. After a few months' regrowth, however, it returns to its natural auburn tint. There is no permanent scarring.

Case for Diagnosis.

By E. G. GRAHAM LITTLE, M.D.

DIAGNOSIS was asked of a tumour on the shoulder of a man, aged 46, a clergyman in a large South London parish. The patient was under the care of Dr. A. E. Wilson, of Lewisham, to whom the Society was indebted for permission to show the case. The history was that about eight years ago the patient noted a small "pimple" on the shoulder which he attributed to rubbing of the braces. The tumour slowly grew larger but never ulcerated, or changed except by enlarging. At about the same time or somewhat earlier the patient was pronounced by a competent consultant to be suffering from phthisis, and tubercle bacilli were freely present in the sputum. He was now apparently in robust health, and had recently been examined and declared to be free from any symptoms of pulmonary tuberculosis. The tumour was now of the size of a five shilling piece, slightly blue in colour over the greater part of the swelling, but at the margins while there was swelling there was no coloration. The surface was lumpy and irregular and raised from the surrounding level of the skin by about a $\frac{1}{4}$ in. Dr. Wilson, who had had the case under observation for some months, was confident that the growth had been much more rapid in the last few weeks, but there was still no change in its character except that a single application of carbon dioxide had been made by Dr. Wilson, and slight ulceration of the surface had resulted in two places from this treatment. A notable feature of the tumour was a curiously hard resilient edge, so that the finger passing from healthy to affected skin had the sensation of touching cartilage, the infiltration being of almost keloidal hardness. There was a rather confused history of a tumour similar in appearance having been removed from the front of the chest at the age of 23 (the scar of the removal being still conspicuous), and that the report of the doctor who had removed it was that "the disease was bordering on consumption." The clinical aspect of the sole lesion now present was quite unlike any tuberculous manifestation with which the exhibitor was familiar, and the case was therefore shown for diagnosis.

The PRESIDENT and several Fellows present diagnosed the tumour as being probably a fibro-sarcoma.

[The patient has been taken into St. Mary's Hospital for excision of the tumour and a report of its nature will be furnished later.]

Case of Syphilis of very Unusual Character.

By E. G. GRAHAM LITTLE, M.D.

THE patient, G. T., a man, aged 42, was under the care of Mr. Duncan Fitzwilliams, who had given the man two injections of neo-salvarsan, which had materially diminished the salience of the eruption.



FIG. 1.

Case of syphilis of unusual character. Photograph of face before injection of neo-salvarsan.

The photographs now reproduced (figs. 1 and 2) had been taken before treatment, and showed fairly well the remarkable prominence of the tumours on the face, giving it something of the aspect of nodular leprosy, and almost constituting the "leonine facies" associated with that disease. The patient had never lived abroad, had contracted syphilis about eighteen years ago, and his blood, recently tested, had given a positive Wassermann reaction. The face was covered with large nodules closely set together and making a surface rather like that of

the "hobnail" liver. The whole scalp was seamed and furrowed, with nodules and depressed scars. The hair was absent over the top and sides of the head. There were large areas of nodular infiltration and scars on the back of the trunk, on the upper arms and shoulders, the middle of the back and the buttocks, on the lower arms, and on the legs and thighs. The two injections of neo-salvarsan had caused a



FIG. 2.

Photograph of body before injection of neo-salvarsan.

considerable improvement in a very short time, the photographs having been taken on October 30, and improvement being already manifest.

The PRESIDENT said the case was of a type now seldom seen in this country, and he suspected it to be of tropical origin, but the man averred he had never been out of this country. His remarkable improvement after two injections of neo-salvarsan was eminently satisfactory.

Case of Lichen Planus Hypertrophicus.

By E. G. GRAHAM LITTLE, M.D.

THE patient, a woman, aged about 65, sent to the exhibitor by Dr. Travers Smith, had a growth on the upper and inner part of the right leg near the knee. The exhibitor showed the case as one of hypertrophic lichen planus, being influenced to make this diagnosis by a patch of lichenified skin, 4 in. by 2 in., on the outer and upper aspect of the same leg, which suggested this diagnosis. The growth was more doubtful in character. It was the size of the palm of one's hand, and consisted of lobulated warty excrescences closely grouped, raised quite $\frac{1}{2}$ in. from the surrounding surface; and in the interstices of the excrescences a very evil-smelling discharge collected. The growth had persisted practically unchanged for three or four years; there was no enlargement of glands in the right groin, and there had not been any ulceration on the surface. There was much itching of the skin affected. No lesion of lichen planus elsewhere than on the leg could be seen, and there was no history of such in the past. The mucous membranes were unaffected.

Sections from the most prominent part of the tumour had been made from two sites and submitted to examination by Dr. E. H. Kettle, who had had a long experience in malignant growths as Pathologist to the Cancer Hospital. Both examinations resulted in a denial of any evidence of malignancy. The exhibitor had seen the sections on both occasions, one taken in September and one taken during the last week. In favour of the diagnosis of lichen planus was the greatly increased thickness of the granular layer of the epidermis. There was some proliferation downwards of the epidermis, but no dissemination of epithelial cells in the corium. There was much inflammatory infiltration round the epidermal downgrowths and considerable increase of pigment cells.

Dermatological Section.

December 18, 1913.

Dr. J. J. PRINGLE, President of the Section, in the Chair.

Report on Dr. Walsh's Case of Epidermolysis Bullosa.¹

THE Committee appointed to report upon Dr. Walsh's case of epidermolysis bullosa met on Thursday, November 27, 1913, at 5.30 p.m. There were present Dr. J. J. Pringle (President), Dr. H. D. Rolleston, Dr. James Galloway, Dr. Leonard Guthrie, and Dr. J. M. H. MacLeod (Hon. Secretary). The Committee was unanimously of the opinion:—

(1) That the position of the heart was normal and that there was no evidence either of hypertrophy or dilatation.

(2) That the heart was beating regularly at about the rate of 88 per minute in the recumbent position.

(3) That there was a murmur present, systolic in time, audible over a large portion of the cardiac area, with its maximum intensity over both third costal cartilages and varying in intensity with respiration, becoming frequently inaudible at the end of deep inspiration when the breath was held.

(4) That the murmur was not due to congenital malformation or disease of the heart, but was an example of the common type often described as a respiratory cardiac murmur.

(5) That the boy showed evidences of slight stagnatory erythema of the extremities, but that this was entirely independent of his heart's action.

(6) That there was no causal relation between the affection of the skin and the condition of the heart and peripheral circulation described.

¹ *Proceedings*, p. 28.

Case of Fordyce's Disease.

By J. J. PRINGLE, M.B.

THE PRESIDENT brought forward a typical case of Fordyce's disease in a medical man, aged 38, who had been affected since 1898. Both lips were affected, the upper much more severely than the lower; but the buccal mucous membrane was free. On the upper lip the lesions had coalesced to form a continuous yellow plaque extending from one angle of the mouth to the other. There was very little inflammation, and the patient was not ostensibly neurotic, although he suffered intense annoyance from the condition, as so frequently happens. He had slight gastric dyspepsia, but no appreciable dilatation of stomach or colon. The case was shown chiefly to elicit opinions with regard to treatment. The exhibitor's experience with X-rays, both in full and in small oft-repeated doses, had been unsatisfactory in a considerable number of cases. He had seen nothing but harm result from scarification and cauterization, as advocated and practised chiefly in France; nor did he think that electrolysis was applicable, as the condition was too agminate. He had heard of a case successfully treated with radium, probably applied "naked" in the form of a plaster and in small quantities, frequently repeated; this procedure he proposed to adopt.

DISCUSSION.

Dr. KNOWSLEY SIBLEY said he had treated a patient with this condition by ionization of salicylate of sodium, and it rendered the patient more comfortable, though he could not say there was much difference in the appearance of the lesions.

Dr. PERNET said that in some of the cases he had seen the subjective symptoms were not very marked, while in others they were very much like those in the present case. He recommended electrolysis.

Mr. T. P. BEDDOES said he saw a case some time ago considerably more advanced than the present one. The man, not satisfied with the advice he got, went to a "cancer curer," who applied a strong arsenic paste. That resulted in removing not only the disease but also the whole lip.

Dr. WHITFIELD said that as this condition evidently made the life of the patient a burden, it seemed justifiable to ask a surgeon to remove the affected area, and skin-graft. He thought it likely that the skin-graft would change into dry, stratified mucous membrane. It could be tried on a small area. He would have thought that full pastille doses of X-rays would have been useful, because complete atrophy of tumours of the appendages and skin could be brought about by X-rays. He believed that these lesions had been found to be non-secreting sebaceous glands or sebaceous rudiments.

Case of Syphilitic Macrocheilia.

By DUDLEY CORBETT, M.D.

THE patient was engaged in tutorial work until his present condition prevented his getting further employment. It began in 1902 with a general enlargement of his lower lip, which extended to the upper lip, and more recently to his tongue. There is a history of syphilis twenty-eight years ago, for which he had a course of treatment for two years. There is never any pain. The extent of the condition varies—cold or mental worry making it worse. He has always been a heavy smoker. There is now a general diffuse hypertrophy of the lips and tongue, most marked in the lower lip. The tissues of the lips have an œdematous and gelatinous appearance, and there is no ulceration. The tongue is enlarged, fissured, and hard at the margins. The teeth, when he first came under observation, were in a very septic condition. They are all now being extracted. Mr. McKay, the dental surgeon, states that he has never seen a similar condition due to sepsis alone. The Wassermann reaction is strongly positive.

DISCUSSION.

Dr. CORBETT asked for advice as to treatment. He proposed to give salvarsan, to be followed by a course of mercury and iodide, and wished to know whether these measures would be likely to clear up the condition entirely, or whether sufficient new tissue would remain to necessitate the use of radium.

Dr. SEQUEIRA said he had had a case one and a half years ago almost identical with this, and the improvement under neo-salvarsan was remarkable. He did not expect the whole of the present swelling would disappear, but that it would be considerably diminished in size.

Dr. GRAHAM LITTLE reminded members that he had shown a very similar case of chronic hypertrophy of both lips in a young man at a recent meeting of the Section.¹ In that case the Wassermann reaction had been negative. The teeth, which had been in a very septic condition, had been removed since the case was shown, and the improvement resulting from this measure alone had been remarkable.

Dr. WHITFIELD said he had had a case which was treated with salvarsan by Dr. McIntosh. The lip was a very big one, and the patient was dying of syphilis. His lip was now so much reduced in size that it hardly looked abnormal. It had been said that mercury failed to cure these conditions, yet he believed it was somewhat beneficial; unfortunately, mercury, while combating the syphilis, acted as an irritant to the buccal mucosa. Hence the benefit was largely counteracted. In the present case, if the patient's teeth were removed, and mercury given, he thought there would be much benefit to the lip. When even one bad tooth remained there was gingivitis, and an increase in the elephantiasis.

Dr. GRAY said he could bear out what Dr. Sequeira had said, as he had a patient of the same kind, and got much the same result. In his case there was also some residual swelling and some scarring round the lip which might account for the incomplete disappearance of the œdema.

The PRESIDENT (Dr. J. J. Pringle) also agreed as to the efficacy of salvarsan. He recently had a similar case in which an enormous hypertrophy of the upper and lower lips had been reduced practically to normal size by three injections of salvarsan. He did not think that radium would be found necessary even as an adjuvant.

Case of X-ray Dermatitis.

By T. P. BEDDOES, F.R.C.S.

L. S., MALE, aged 37. The patient began X-ray work in 1898. He went to South Africa in 1900 and, four weeks after landing, vesicles formed on the hands, but work was continued until March, 1902, eleven years and nine months ago. A callosity on the left index-finger became prominent in 1911, and an ulcer formed. The special interest in the case was that the patient now required active treatment after having definitely, on account of an attack of typhoid fever, given up X-ray work eleven years ago.

¹ *Proceedings*, p. 5.

DISCUSSION.

Dr. SEQUEIRA recalled a case recently published by Darier, the patient having had a supposed mammary carcinoma. Twelve years ago she had thirty exposures to X-rays, each of fifteen minutes' duration. At the end of the course she had slight dermatitis at the site of the X-ray treatment. That cleared up, and she had no symptoms for eleven years and seven months. She was now under Dr. Darier's care with an X-ray ulcer which was quite characteristic. He suggested excision of the ulcer and grafting in the present case.

Dr. WHITFIELD said that a case had been sent to him in which the patient had a needle in the foot twelve years ago, at which date X-ray technique was not what it was now. The rays were used a good deal to find the needle, but always without effect. At that time the patient had a fairly large burn caused by the rays, which ulcerated in the centre and then healed. It remained healed until last year, and then broke down, causing agonizing pain. He advised excision, and this was done by Mr. Mower White, who left the ulcer dressed for about a week before skin-grafting. The moment it was excised, although a raw surface was left, the pain disappeared, and when grafting was done it healed nicely. He strongly agreed with Dr. Sequeira's advice regarding excision.

Dr. ADAMSON said this case was important because it showed that an epithelioma might arise from an X-ray scar the result of an acute dermatitis of mild form and long after exposure to X-rays had ceased. It was formerly taught that X-ray cancer arose from the stimulation of the epithelium by repeated small doses of X-rays. The speaker had disputed this theory in a report upon X-ray dermatitis published in the *St. Bartholomew's Hospital Reports* for 1909 in conjunction with Dr. Lewis Jones and Mr. Rawlings. Repeated and long-continued applications of X-rays were not essential for the production of malignant epithelioma. Malignant epithelioma might arise upon a scar the result of a dermatitis from a single dose of X-rays. These growths were due to the irregular proliferation of the epithelium, not as the immediate result of any stimulating action of the rays, but as a consequence of the disturbance of the normal relationships or balance between the epidermis and the corium which occurred in the scar of an X-ray burn. It was analogous to the disturbance of balance present in the scar from sunburn and to a less degree in scars from any cause, which might also lead to irregular proliferation of the epithelium in the form of warty growths. He fully agreed with the advice to excise the growth at the earliest opportunity.

Dr. GRAHAM LITTLE said that he had seen at Darier's clinic the case of retarded development of epithelioma after X-ray treatment to which Dr. Sequeira had referred, and Dr. Darier had on that occasion referred to another

case like Dr. Whitfield's, namely, the development of epithelioma after a skiagram had been taken of a foot in which a needle had become accidentally embedded.

Dr. NORMAN MEACHEN reminded members of a case he showed at the International Congress of Medicine in August, the patient being a boy who had had enlarged glands in the neck, and was treated with X-rays five years ago. He came with a superficial ulceration, and very marked X-ray dermatitis, which agreed with the cases which Darier termed "delayed radio-dermatitis." He (Dr. Meachen) had a similar case recently in a young man, a musician, who had had X-rays applied for tinea. There was a patch of baldness remaining, and on that was a shallow, very indolent, slowly healing ulcer. The last application of the X-rays was seven years ago.

Dr. KENNETH WILLS said a point of interest might be the treatment which led to the ulceration. This present patient said he saw a wart and treated it badly, cutting it off once or twice with a razor, and knocking it about a good deal by handling nuts and spanners in connexion with his motor bicycle. This case came home to one when personally suffering from warts following the application of X-rays. He had had such warts on his hands, and got rid of them by means of carbon dioxide snow. They did not recur in the same position.

Case of Vegetating Syphilide.

By S. E. DORE, M.D.

THE patient, a man, aged 47, had suffered from soft sores on the penis twenty years previously but had had no eruption on the skin, or other syphilitic manifestation, until six months ago, when the present eruption appeared. The lesions were first noticed on the back of the neck and were followed by others on the face and scalp. With the exception of a small patch on the left elbow these were the only parts of the body affected. The lesions consisted of numerous protuberant fungating and ulcerating crusted lesions scattered irregularly over the scalp and hairy parts of the face, with a preponderance on the eyebrows, upper lip, and the sides of the chin, where the heaped-up crusts were very prominent. On the scalp some of the ulcers had left deep scars. The Wassermann reaction was negative, but as the patient had been taking Donovan's solution the blood was examined again a month later after all drugs had been stopped. The result on the

second occasion was "very slow but complete hæmolysis." In the exhibitor's experience salvarsan gave excellent results in this type of case where mercury and iodide failed, and he proposed to adopt this method of treatment.

DISCUSSION.

Dr. ADAMSON called attention to the close resemblance of the lesions in this case to those of blastomycosis, as pictured by American observers. No authentic case of blastomycosis had been observed in this country, and he agreed with the diagnosis of syphilis.

The PRESIDENT said the first case of syphilis in which he had ever ordered "606" was one approaching this in type, and the recovery after one injection was so rapid and complete that he did not see the patient till three months afterwards, when the improvement persisted. The case had previously resisted all forms of treatment, not only at his own hands but at those of many others. He could not help thinking that iodine sometimes played a rôle in the production of frambœsioid lesions, such as the patient presented.

Case of Congenital Hyperkeratosis of the Palms and Soles.

By S. E. DORE, M.D.

THE patient was a male child, aged $4\frac{1}{2}$. The condition was noticed at birth and was attributed by the mother to a fright from a chicken when she was pregnant. The palms and soles presented a thickened plate of horny epidermis which was rough and "worm-eaten," and deeply fissured at many of the flexures, so that there was considerable difficulty and some pain on movement. On the points of the elbows and dorsal surfaces of the ankles were similar but less well developed patches of thickened skin. In the latter position the lesions were linear, and followed the direction of the extensor tendons. The skin over the knuckles was also thickened with accentuation of the natural skin-folds. There was no history of heredity, and the present patient was one of six children, none of whom was similarly affected. The Wassermann reaction was negative.

DISCUSSION.

Dr. MACLEOD said that he considered that in the present state of our knowledge it was advisable to retain the name "congenital hyperkeratosis" for these cases, and not to class them under the heading of ichthyosis, as they belonged to the group of the nævi.

Dr. F. PARKES WEBER said that the most remarkable feature of these cases was that they constituted the only kind of nævus involving the ends of all four extremities. The best way of looking at such congenital cases was to regard them as due to a nævus formation of symmetrical acro-keratosis type.

The PRESIDENT said he agreed that it was better to separate these cases from true ichthyosis, especially as they were only very exceptionally associated with that disease, or with hystrix. Radcliffe-Crocker's name "tyloma" was a convenient one. He could not, however, agree with Dr. MacLeod that the palms and soles of true ichthyotics were generally normal. His own experience confirmed the observation of Radcliffe-Crocker, that the palms and soles were generally smooth and dry, the major natural lines being deepened and the minor obliterated. Besnier held the same opinion.

Case of Congenital Alopecia.

By S. E. DORE, M.D.

THE patient was a child, aged 2. The scalp was bald with the exception of a tuft of long dark hair on the vertex and a fringe surrounding the head in the occipital and inferior parietal regions. The eyebrows were affected, but the eyelashes were normal. The mother stated that the hair began to grow when the child was 12 months old, and she suffered from an abscess of the breast at this time when she was suckling it. There was no family history of baldness and the patient's sister, aged 4, had a good head of hair. The mother also had a healthy baby a few weeks old. The patient's blood was at first reported to have given a weak positive reaction, but at a second examination it was negative.

Dr. SEQUEIRA said he had had forty cases of alopecia areata, and three of the congenital type examined by the Wassermann test. Three cases of acquired alopecia gave a positive reaction, but in all of them there was other evidence of syphilis.

Case of Bromide Eruption in a Child, aged 7 Months.

By S. E. DORE, M.D.

THE eruption was of four weeks' duration. The lesions varied from small papules and papulo-pustules, chiefly situated on the limbs, to large, protuberant, granulomatous masses, exuding pus, on the face, forearm, and buttocks. The mother had not taken any medicine when she was suckling the baby, but she had given it four teething powders at intervals of a week, and the rash had appeared about a week after the last powder was taken. Fresh lesions had continued to appear since this time, although no more powders had been given. The child was somewhat constipated, but in other respects was in good health. The powders were stated to have made the child sleep, but a published analysis of their contents did not indicate that they contained bromide of potassium.

Case of Dermatitis Artefacta.

By W. T. FREEMAN, M.D.

THE patient, a girl, aged 22, was admitted into the Royal Berkshire Hospital early in September of this year and was discharged with the



Case of dermatitis artefacta.

lesions healed at the end of October. The condition had existed previous to admission for five months. It was said to have started with red spots and blisters upon the hand and fingers and to have slowly spread up the arm to the shoulder.

Upon admission the fingers, hand, forearm, arm, and shoulder of the left side were the sole affected parts. The whole of this area was

thickly covered with a mixture of macules, vesicles and pustules, with quite a score of superficial undermined ulcers of oval shape, many of them as large as a half-crown piece. Subjective symptoms were comparatively slight.

When exhibited the affected area showed much small scattered pigmentation, and the seats of the ulcers were very distinctly marked out as red scars, three of the scars having taken on considerable keloid growth. Since her discharge from the hospital there had apparently been no fresh lesions upon the left arm, but she accounted for two small burns upon the back of her right hand by saying that they were caused by sealing wax. For the past year or so she had been living at home with her parents, and had been previously employed at a post office. It may be added that the ulcers and scars had a peculiar linear arrangement.

Case of Dermatitis Artefacta.

By GEORGE PERNET, M.D.

THE patient, a woman, first came under observation on November 4, when the duration of the condition was four months. The right arm presented various quadrilateral and streaky lesions, but fresh and different ones had been appearing at intervals since. Several had been and were necrotic, and were black and irregularly circular and angular. There had been hemianæsthesia.

DISCUSSION.

Dr. SIBLEY said it was a curious fact that here were two patients, both right-handed individuals, in the one the lesions were limited to the left arm and in the other to the right arm. He suggested that in Dr. Pernet's case a primary lesion was produced accidentally on the right arm, and that from this accident the idea occurred to produce other lesions.

Dr. SEQUEIRA pointed out that the feature alluded to by Dr. Sibley had been long universally recognized.

Dr. STOWERS said that as in Dr. Freeman's case the primary lesion was due to accidental burning by sealing-wax—the patient being employed as a post office clerk—it was not improbable that the subsequent development was the result of the same process voluntarily applied. It was well known that owing to the peculiar mental condition of such female patients the production even of severe pain did not act as a deterrent against self-inflicted injury, of which he had seen numerous instances.

Case of Lichen Spinulosus with Lichen Planus.

By J. M. H. MACLEOD, M.D.

THE patient was a healthy-looking boy, aged 12. His parents were alive and there was no history of tuberculosis in the family, nor were there any tuberculous stigmata present in the patient. On his neck and face were a number of small, soft, pigmented moles varying in size from a pin's head to a split pea. Since he was aged 8 lichen spinulosus had been present on his skin. At the time of exhibition that affection was evident in the following situations: On the back of the right shoulder there was a patch about the size of the palm of the hand of typical lesions consisting of follicular papules, some the colour of the skin, others slightly pinkish, rounded or acuminate in shape, and many of them presenting dark horny plugs or short white spines at the apices. In the corresponding situation on the left shoulder were a few discrete spiny papules. The pilo-sebaceous follicles on the sides of the trunk were prominent, but not definitely spiny. On the extensor aspects of the arms, especially over the elbows, the follicles were prominent, like permanent goose-flesh, or formed acuminate papules with horny plugs, so that the skin felt rough, like a nutmeg-grater. Similar lesions were present though more sparsely distributed on the extensor aspects of the leg and the follicles on the calves were distinctly prominent. There were no subjective symptoms associated with the follicular and spiny lesions.

About six weeks ago a typical eruption of lichen planus in the form of discrete, flat, polygonal papules, violaceous in tint, smooth, shiny and presenting the characteristic milky-looking network on the surface, appeared on the flexor aspects of the arms, extending from the middle of the upper arm to the wrist, in the axillæ, and on the pubes, groins, and legs from the knees down to the dorsa of the feet. Here and there the individual plane papules had coalesced to form conglomerate papules about the size of a split pea. The plane lesions were intermittently itchy.

The case was exhibited with the object of eliciting the opinions of the members with regard to the relation between the lichen spinulosus and the lichen planus. In adults it is no uncommon occurrence to find spiny lesions in association with plane lesions, as in the type of case

described by the President as lichen plano-pilaris, but this association is, in my experience, rare in children. In differentiating between lichen spinulosus and lichen planus, the sensory symptom of itching is of importance, for it is usually absent in the former and present in the latter. In this case, so long as spiny lesions alone were present there were no subjective symptoms, but when the plane lesions appeared slight itching developed and was confined to them. It would seem, then, that in this case there might be two distinct affections and that their association might be accidental. There was nothing in the general condition of the boy to suggest either a toxic origin for the lichen spinulosus or a neurotic influence which might in some way be responsible for the lichen planus.

DISCUSSION.

Dr. ADAMSON said he thought lichen spinulosus in an adult always meant that the patient was going to have lichen planus. In all the cases he had seen in adults lichen planus eventually developed. In children one found this condition without lichen planus, the latter being rare in children; but Dr. MacLeod had shown cases of lichen spinulosus and lichen planus coincident in children, and he was inclined to regard lichen spinulosus as a manifestation of lichen planus even when it occurred without planus lesions in children.

Dr. WHITFIELD said he thought that the lichen spinulosus papule had, in the absence of local treatment, no tendency to get well; therefore it might occur shortly before an attack of lichen planus, or at any time before it, and might last indefinitely. Thus the length of interval was not of great value.

The PRESIDENT said he believed he was the first person to draw attention to the relationship of true lichen spinulosus (or pilaris) to lichen planus, and he had coined the term "lichen plano-pilaris," which he had sometimes seen associated with his name. He agreed with Dr. Adamson that in the adult lichen spinulosus was a clinical expression of the same pathological condition as gave rise to lichen planus—whatever that might be—and the two conditions were constantly seen in association. He had some doubts, however, as to the boy shown being a real example of the association. The spiny lesions were of far older standing than the undoubted planus papules present, and some of them were surrounded by a small pustulette; he was therefore inclined to regard them as an exaggerated congenital keratosis (or ichthyosis) follicularis rather than as an acquired condition or real lichen, and this view was strengthened by their distribution.

Case of Lupus Erythematosus.

By W. KNOWSLEY SIBLEY, M.D.

THE patient is a woman, aged 35, suffering from a very extensive lupus erythematosus of the scalp and face. The disease commenced nine years ago in the middle of the frontal region of the scalp, and has gradually extended. The hair-follicles over the whole of the fronto-vertical region of the scalp have been destroyed as far as the occipital region. The whole of this area is covered by superficial smooth scar tissue, and completely denuded of hair, but the active disease in this region has ceased, in a fairly regular line all round the scalp. Both the cheeks, nose, forehead, upper lip and chin are covered with an active erythematous scaly eruption which is also slightly present in and behind the ears. There is not any obvious affection of the fingers, though the patient suffers slightly from chilblains.

With regard to treatment, very satisfactory results are being obtained by painting the lesions with a mixture of acetone and carbon dioxide snow.

DISCUSSION.

Dr. SEQUEIRA said he had tried the method just described, and found it gave the patient more pain than did the application of the snow by means of the solid stick.

Dr. ADAMSON said it was known that exposure to extreme heat and cold often made lupus erythematosus worse, and he did not quite understand how the snow acted in the case now exhibited. He wondered whether, in this case, the rest in bed had anything to do with the subsidence of the erythema; also how much was contributed by the calamine lotion. Rest in bed had a marvellous effect in some cases of the condition. The method of applying the snow lightly and momentarily seemed deserving of further trial in acute cases.

Dr. MACLEOD said he had treated a considerable number of cases of lupus erythematosus by freezing with CO₂ snow. The cases which benefited most were cases of the circumscribed type, and the benefit seemed to be due to superficial scarring secondary to inflammation. He had employed the method suggested by Dr. Sibley—namely, of CO₂ dissolved in ether—but no definitely beneficial results were obtained.

Dr. DORE said he agreed with Dr. Adamson that it was difficult to understand how the superficial action of a freezing mixture could have such a

beneficial effect. The advantage of using a solid stick of carbon dioxide lay in the pressure which could be exerted, and a certain amount of deep destruction of tissue which ensued. He suggested that an ethyl chloride spray might prove as beneficial as liquid carbon dioxide snow.

Dr. DOUGLAS HEATH asked whether the ultimate cosmetic results of the treatment were good, whether Dr. Sibley had tried one side with the quieting down methods, and the other side with carbon dioxide snow, and whether he found the results of the latter equal to those of slow natural recovery.

Dr. GRAY said many of these cases of lupus erythematosus improved if one produced a mild inflammation. The Kromayer lamp, the Finsen lamp and such methods often gave good results. He had not had very satisfactory results with Dr. Sibley's method. Most of the cases progressed only to a certain point, and one flared up into an acute case.

The PRESIDENT said anything which rendered assistance in the treatment of lupus erythematosus was worth discussing. If the lesions were well defined and of "fixed" type, several fairly active measures could be adopted with impunity; but if the borderline was ill defined the greatest caution was necessary. He thought the value of mild X-raying was under-estimated. The early promise of carbon dioxide snow, applied in the usual manner, had certainly not been fulfilled; and he had seen many disappointing results from cataphoresis. Dr. Sibley's acetone-CO₂ snow combination seemed well worthy of trial.

Dr. SIBLEY, in reply, said that the method did not cause more pain than the solid stick, but it was often applied over a much larger area. The patient had been in St. John's Hospital five weeks, and had previously been six months an in-patient in another hospital without any improvement. Several other cases on whom he had used the method were out-patients. He believed the benefit was due to the counter-irritation. In this case the edges of the eruption were very ill defined, and it had crept up, especially over the ear region. The amount of reaction depended on the way in which the remedy was applied. He simply dipped a camel-hair brush into the mixture, and gave the area one sweep over. By going over the same area several times, one could freeze the skin solid. It quieted down quickly. Acetone made a better mixture with snow than ether, as it did not effervesce so violently, and was much less volatile. The temperature of the acetone mixture was that of carbon dioxide snow—namely, -79° C. He only used it in the chronic type of lupus erythematosus.

Case of Stomatitis Neurotica Chronica.

By W. KNOWSLEY SIBLEY, M.D.

THE patient is a woman, aged 38, of a distinctly neurotic type. She has been married six years but never been pregnant. For the last two years she has suffered slightly from a general seborrhœa. Ten months ago she experienced a sudden severe aching and burning in her face, and numerous ulcers appeared on both sides of the buccal mucosa. These have persisted on and off ever since, she has never been free from ulcers, and at times they have been present on the tongue. At the present moment there are some small ulcers and scarring on the middle of the mucosa of the left cheek. Scars are also present on the corresponding area of the right side, and some scars are obvious on the dorsum of the tongue. The patient states she has never been free from ulcers in the mouth for over ten months; at times they are very painful and distressing. They are generally worse before each catamenial period. She tells us she is very apt to worry over trifles, and has always done so. The Wassermann reaction was negative. Cultures obtained from the ulcers produced growths of streptococci and staphylococci of the albus type.

In 1894, Jacobi, of New York, published three cases of this disease. Isolated cases had previously been described by Kaposi, Kopp, Flatau, and Mandelstamm under the headings of "Trophoneurosis Hysterica," "Chronic Recurrent Herpes of the Oral Cavity," and "Pemphigus of the Buccal Mucous Membrane." In 1899 I published three cases, all in women: the one, a widow, aged 74, who had suffered from the complaint for over twenty-five years, and who fifteen years previously had had all her teeth removed, without any improvement in the condition. Her life was rendered at times almost unbearable from the pain and discomfort of the ulcers, which used to appear on almost any part of the buccal mucous membrane, the cheeks, gums, tongue, and lips, and rendered speaking and mastication almost impossible for days together. Another case occurred in a spinster, aged 50, who had suffered from troublesome ulcers in the mouth almost as long as she could remember, and in her case at one period they were associated with attacks of conjunctivitis. These two patients are still alive, and have now both practically ceased to be troubled with the complaint.

Of the recognized skin lesions, this condition most closely resembles that of dermatitis herpetiformis, which is essentially a dermatitis neurotica chronica.

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DISCUSSION.

Dr. ADAMSON said he regarded the case as lichen planus annularis on the tongue and palate. The patches upon the tongue were, he thought, quite typical of lichen planus of that organ. It was well known that lichen planus annularis might persist for many years, and it had a special tendency to attack mucous membranes.

Dr. F. PARKES WEBER said he had fairly recently studied a similar very chronic case in a woman, aged 27.¹ The history of such cases did not suggest lichen planus. One would have to bring forward cases showing the associated occurrence of lichen planus on the body in order to prove that cases like the one under consideration were a variety of that complaint localized to the mouth. In his own recent case, painting with a very weak solution of chromic acid seemed readily to remove the lesions for a time. This was at first tried on the supposition that there might be a syphilitic element present, but it afterwards became apparent that the patient was not syphilitic, and Wassermann's reaction was negative.

Dr. GALLOWAY remarked that he had had the opportunity of seeing the type of disease from which Dr. Sibley's patient suffered on several occasions. His association with colleagues interested in dental surgery at Charing Cross

¹ One of the most interesting papers on the subject since Dr. Sibley's account in the *Brit. Med. Journ.* (1899, i, p. 900) was that of Löblowitz in the *Archiv f. Derm. u. Syph.* 1910, cii, p. 191. Dr. Weber had only come across two or three cases.

Hospital had brought him into contact with cases of this type of disease more than would otherwise have been the case. He regarded the chronic superficial vesication and ulceration occurring on the mucous membrane of the cheeks as being of infective origin, often associated in the first instance with inflammatory conditions of the gums. The diseased condition lasted for a long time and was liable to recurrences; in all probability the mucous membrane became injured as the result of the early infective attacks and remained more susceptible to slight injuries in consequence of this. He felt much more inclined to associate the condition with bacterial infection of the buccal mucous membrane rather than to refer it to a neurotic origin. He agreed that it did not resemble the type of lesion produced by lichen planus affecting the buccal mucous membrane.

The PRESIDENT said he had been familiar with such cases for many years, and had always regarded them as "recurrent herpes" of the mucous membrane of the mouth, analogous to herpes facialis or progenitalis. He did not share the opinion expressed that the condition was lichen planus. He had often observed distinct herpetiform grouping and configuration of the lesions. He recognized their tendency to recur, and their obstinacy, and he habitually associated them with the neurotic temperament and often with neurotic dyspepsia. He did not know their ætiology any more than that of other forms of recurrent herpes, but he could confirm Dr. Parkes Weber's observation that sometimes a weak application of chromic acid was beneficial.

Dr. SIBLEY, in reply, said that the cases he had recorded never presented lichen planus on the body. With regard to the septic theory, in the case of one lady with the condition, fifteen years before he saw her she had all her teeth removed, yet the ulcerations persisted, and always recurred when she had any domestic or other worry. According to Jacobi the condition was uncommon.

Case of Parapsoriasis en Plaques.

By A. M. H. GRAY, M.D.

THE patient is a male, aged 43, a baker by trade, whose complaint began in January, 1910, with irritation of the legs, especially marked at night; this irritation has persisted more or less till the present time. He was sent to University College Hospital in February, 1911, by Dr. H. C. Samuel. At that time he was suffering from pediculosis pubis, which rapidly responded to treatment, but in addition to this it was noticed that he had symmetrically placed, salmon-red lesions on the lower limbs. These lesions were situated in the region of the

knees, both on the lower part of the thighs and upper part of the legs. They were few in number, mostly circular or oval in outline, with the exception of a symmetrical pair of patches on the thigh, which were linear in character and placed longitudinally; these looked as though they had been produced by rubbing with the finger. The colour was a pale salmon-red. The patches were quite distinct from the surrounding skin, though the margin was not quite sharply defined. There was no scaling at this time, and the patches were not appreciably infiltrated. Since that time more patches have developed on the lower limbs and they have become covered with fine scales. Similar patches have also appeared below the nipples and on the extensor aspect of each arm. In the latter situation they are smaller, not exceeding an inch in diameter, and are extremely like patches of seborrhœic dermatitis. The patient is in other ways quite healthy. The Wassermann reaction is negative, and the blood count shows no abnormalities.

The patches and the irritation have both been very resistant to treatment. The irritation has, however, almost completely subsided under repeated exposures to the Kromayer lamp, and although he has not recently had any treatment there has not been much recurrence. On the other hand, although the patches almost disappeared after the Kromayer treatment, they have come back again since it has been stopped, but they are much paler, less well defined, and more scaly. A portion of one patch on the right thigh was excised and examined microscopically.

Microscopical Report.—The horny layer is irregular and separates easily from the deeper layers of the epidermis, and there is a tendency for the different layers to separate from each other; here and there are groups of nucleated cells. Both granular and prickly layers are increased in size and there is some œdema of the prickly cell layer; the basal layer is œdematous, and a few lymphocytes can be found between the cells. The papillæ are in some places completely flattened out, but present in others. The most marked changes occur in the subpapillary vessels, especially in the horizontal vessels. The endothelium is hypertrophied, in some cases practically occluding the vessels; there is a marked overgrowth of connective tissue cells around these vessels and an exudate of small round cells; here and there plasma cells are seen. These vascular changes also occur in the papillary and perifollicular vessels. There is some œdema of the superficial layer of the dermis, but no changes can be observed in the deeper layers.

From the clinical point of view the case is of interest on account

of the itching present. It has been pointed out that these cases of chronic erythrodermia sometimes occur in people employed in occupations involving exposure to great heat, and that is the case with this patient. It is also noticed in this case that a return to work nearly always brings on a return of the irritation, and it therefore seems probable that this is responsible for this symptom.

With the exception of the itching this case appears to be practically identical to the case shown at the October meeting of the Section¹ by Dr. Bunch as "xantho-erythrodermia perstans."

DISCUSSION.

The PRESIDENT agreed with Dr. Gray's diagnosis and expressed his appreciation of the value of his microscopical observations. He said he thought xantho-erythrodermia was a variant of the condition described as parapsoriasis *en plaques*. He had tried—but in vain—to bring up a patient who had the disease in an exaggerated degree. He was a well-known author, of intensely neurotic habit, who habitually poisoned himself with tobacco. In his case the irritation was extreme, but he did not think irritation was an essential or generally prominent feature of the disease.

Dr. DOUGLAS HEATH pointed out that the disease, when it attacked the chest, showed a downward trend in a symmetrical elliptical fashion, and asked whether Dr. Gray had noticed that. Psoriasis and pityriasis rosacea never seemed to have that peculiar distribution, or at any rate never showed it to such a marked extent.

Dr. GRAY replied that he had not noticed the feature of the distribution pointed out by Dr. Heath, but the patches were often linear, as if the skin had been stroked with the finger.

Unusual Lichenoid Eruption in a Boy, aged 7.

By J. H. SEQUEIRA, M.D.

THE patient, G. M., was an anæmic, wasted boy with a thin, pinched face, and rather prominent abdomen. The child had evidently been neglected, and it was impossible to get a reliable history as to the onset of the eruption, but it was known that it had been present as far back as March, 1913. The eruption consisted of numerous red and reddish-brown papules varying in size from a pin's head to a millet-seed. Most

¹ *Proceedings*, p. 16.

of the lesions were round, and many of them were dome-shaped, while the minority were flat. The surface of the papules was smooth and glistening, and in some instances there was a central depression, but this was not a characteristic feature. There were no Wickham's striae. The eruption was confined to the trunk and upper extremities; the papules, of which there were hundreds, were studded all over the surface, but in no instance was there confluence or the formation of patches and plaques. The papules felt firm to the touch. There was no itching nor any subjective symptom. The mucous membranes were free. At first the eruption suggested lichen planus, but the absence of itching and of the characteristic lilac tinge and of any tendency to coalescence was held to negative this opinion. The exhibitor suggested that the condition was a papular tuberculide, differing in many respects from lichen scrofulosus in its arrangement and grouping, but probably allied to that condition. The patient was still in hospital, and the results of further investigation would be reported later.

DISCUSSION.

Dr. BOLAM thought that the case was tubercular. He had seen a similar case in an older patient, some of the lesions of which were upon the face, and which microscopically showed definite giant cells such as had been found in the present case.

Dr. MACLEOD said he thought that the lesions were "tuberculides," and recalled a case where he had seen somewhat similar lesions on the face.

Dr. ADAMSON considered that it was a tuberculide, though it was a very good imitation of lichen planus. On close inspection the papules were dome-shaped and not flat and burnished as in lichen planus.

Dr. WHITFIELD regarded it as abnormal lichen planus. He agreed as to the presence of dome-shaped papules, but they could be seen also in lichen planus. There were an enormous number of triangular papules, apparently just cropping up, and that was his only reason for thinking it was lichen planus. The lesions of lichen planus could be divided into the visible and the invisible; there was a finer rash seen only with a side light and with the lens in one's eye. What made him doubtful about his diagnosis was the absence of Wickham's striae.

The PRESIDENT said that on mere inspection he would have diagnosed the case as lichen planus. The angularity of some of the papules with central dells, their "patterning," and distribution on the trunk and limbs to the exclusion of the face, all spoke in favour of that diagnosis. The complete absence of itching was, however, against it, and the microscopical showings must be accepted as final. He asked Dr. Sequeira to bring the case again before the Section or to report on it.

Case of Multiple Neuromata.

By J. H. SEQUEIRA, M.D.

THE patient, C. H., a married woman, aged 53, had had a number of small tumours on the extremities for many years. The history was very vague, but it appeared certain that they were noticed in childhood. There had been some increase in their size during the past few years. The patient was a fair woman, with numerous large brown freckles on the face, neck, backs of the hands and forearms. She had always been very susceptible to sunlight, but the freckles never disappeared, though they were more marked in the summer months. Her general health was good, but her mental development was distinctly subnormal. Scattered over the upper and lower extremities there were numerous hemispherical and ovoid, rather hard tumours about the size of a pea and of the same colour as the rest of the skin. They were freely movable over the underlying tissues. The surface of some of the excrescences on the forearms was rather scaly and here and there excoriated from scratching. There were a few similar lesions on the shoulders, but the face, neck, and the rest of the trunk were free.

No diagnosis was made until one of the tumours had been examined microscopically by Dr. Turnbull, who reported that the growths were true neuromata. The interesting features of the case were the limitation of the lesions almost entirely to the limbs, and the pruritus. It obviously might be included under the designation of von Recklinghausen's disease.

Case for Diagnosis.

By E. G. GRAHAM LITTLE, M.D.

DR. GRAHAM LITTLE showed a case for diagnosis, the patient being a young man, aged 20, upon whose left knee, just above the patella, a tumour had begun to grow from two to three months ago. It was quite painless, of the size of a half-crown, raised about 1 in. from the surrounding skin, bluish in colour, with a lumpy surface and a hard base.

It had grown rapidly, and within the last three weeks another more deeply situated nodule, the size of an almond, had appeared about 1 in. below and outside of the earlier lesion. The skin over this later swelling was of normal colour, and freely movable. There were no lesions elsewhere, and the man was otherwise well. The general aspect of the tumour was strikingly like the tumour on the shoulder of a clergyman shown by the exhibitor at the November meeting of this Section.¹ Histological examination of that case had proved it to be a fibrosarcoma, with preponderating fibromatous tissue, but the tumour had taken nearly eight years to grow to a size almost the same as in this later case. A report of the nature of the growth in the present instance would be furnished subsequently.

Dermatological Section.

January 15, 1914.

Dr. J. J. PRINGLE, President of the Section, in the Chair.

Case for Diagnosis.

By H. MACCORMAC, M.B.

J. P., AGED 67. The patient had always resided in England and, save for some slight rheumatism and bronchitis, had always been healthy. He now had arterio-sclerosis. The present condition began about eighteen months ago (in midsummer) as an itching eruption confined, according to the patient's statement, to the flexor aspects of the knees and to the axillary regions. Then "pimples" appeared on the legs, spread to the chest, and then gradually until the present condition was reached.

When first seen in April the eruption extended over the thorax, abdomen, arms, and thighs. The mucous membranes were not affected and the face was free. The lesions consisted of little nodules about the size of a hemp-seed, of solid character to the touch, and set closely together. Here and there excoriations and small blood crusts, the result of scratching, were seen, and there was some general pigmentation. Over the shoulders a considerable degree of scarring existed, but these apparently had no connexion with the present condition. In some regions—especially over the lower part of the thorax in front—areas free from the condition existed. The lesions apparently disappeared at times; the patient stated that they might come and go in twenty-four hours, but this had not been verified. At one period a very considerable number disappeared completely, but at present they were more numerous than at any other time. The duration of any nodule

was probably to be reckoned in weeks or months. Itching was experienced during the waking hours, and was severe. It did not interfere with sleep. During the course of the disease he had an attack of herpes zoster, and, for a time, there was a purpuric eruption of the legs. The blood count was normal, and the Wassermann reaction negative.

DISCUSSION.

Dr. MACCORMAC, in answer to the President, said he regarded the case as belonging to the urticarial group, but was not clear as to the type of skin disease in which it should be classed. Two sections which had been prepared were not satisfactory, and the third was not yet ready. The second specimen showed round cells grouped together in the subepidermal region.

The PRESIDENT (Dr. J. J. Pringle) had never seen an identical case and was inclined to consider it as one *sui generis*. The periodical variations in intensity, the severity of the itching and the wheal-like lesions all seemed to point towards its belonging to the urticarial group of diseases. The nodular papules more closely resembled those of true prurigo than any familiar condition, and the amount of coarse lichenification favoured his conception of the case as being a true prurigo senilis. He had seen the case once previous to its exhibition and had hurriedly run through recent French literature of the subject, thereby arriving at the conclusion that it was not an example of Besnier's *prurigo diathésique*.

Dr. WHITFIELD said that the first disease which came into his mind when he saw this case was the so-called pseudo-leukæmic prurigo, but he found no other symptoms of pseudo-leukæmia, and the blood examination would not give any help. It might be that the general condition would develop later, but of course that was purely hypothetical. He had been through the literature of the eruptions in pseudo-leukæmia some three years before and he did not remember finding any record of the eruptions preceding the other symptoms of the disease. The French authors described a disease which did not always begin in children and which they called *prurigo à papules grosses*, and he wondered whether this might be an example of it. At any rate, he agreed that this was a prurigo papule and he thought if examined it would show a curious dropsical degeneration of the deeper layers of the epidermis, a good deal of oedema of the papillary body, and some collection of small round cells.

Dr. SEQUEIRA said he had recently been through the literature of some of these conditions, and he believed there was not only a papular but also a small nodular type of prurigo described. They occurred in adults and were very chronic.

Dr. MACLEOD expressed his agreement with the President's view. At first he thought it was possibly pseudo-leukæmic prurigo. At the International Congress he showed an elderly man with papules not unlike those in the

present case, all over the body. There was much pigmentation, and one could see dug-out scars. It turned out to be dermatitis herpetiformis, but he did not think the present case was one of that disease. He agreed that the present patient's condition was a disease *sui generis*—a toxic prurigo occurring in an old man.

Dr. PERNET said a prurigo (*prurigo diathésique*) had been described by Besnier, and he had been in the habit of giving the name "prurigo de Besnier" to cases in elderly people presenting irritating papules somewhat of this type. The case might fit into that category, though it was of a more aggravated type than he had ever seen.

Dr. DOUGLAS HEATH said one met with cases of old people with a very severe irritation of the arm or leg or in the beard area, and yet no nodules of this kind developed, so there must be some toxic element, or some peculiar susceptibility in this case. In his experience it was uncommon for urticaria to develop into a pruriginous condition. The present form was most like the urticaria seen in toxic conditions such as jaundice. Intestinal intoxication might be at the bottom of it; possibly the man had obstinate constipation.

Dr. F. PARKES WEBER said he also did not think that the case was one either of so-called "pseudo-leukæmic prurigo" or of cutaneous nodules connected with true leukæmia. He did not know whether in pseudo-leukæmic prurigo the cutaneous papules were ever as numerous as in Dr. MacCormac's patient. He thought that in using the term "pseudo-leukæmic prurigo" one must regard "pseudo-leukæmia" as synonymous with Hodgkin's disease, which in reality it was not. So far, in this case, there were said to be no signs in the blood of true leukæmia. The presence of great itching was, moreover, a point against diagnosing the case as one of true leukæmia with multiple cutaneous deposits, but without any as yet typical blood changes.

Dr. WHITFIELD, in further comment, said he wished to make his position clear. He was quite familiar with leukæmic growths of the skin; the growths of lymphadenomatous prurigo (Hodgkin's prurigo) had no relation, anatomically, to true leukæmia of the skin. The tumour growth of leukæmia could be diagnosed at once; it did not consist of small nodules but of infiltrated patches. He did not think that in this Section there was likely to be confusion between prurigo or the pruriginous papule in Hodgkin's disease and the leukæmic infiltration which one found in true leukæmia.

Case of Pityriasis Rubra Pilaris.

By J. H. SEQUEIRA, M.D.

THE exhibitor was indebted to Dr. Keane, of the North-Eastern Fever Hospital, for the opportunity of examining this case and also for the notes of the earlier condition.

Abstract of Dr. Keane's notes: R. B., aged 9, female, was admitted to the Fever Hospital on September 23, 1913, certified as scarlet fever, which diagnosis was confirmed. On October 3 Dr. Keane noticed very extensive desquamation on the trunk, with a "second rash" appearing beneath. The erythema and desquamation in a few days involved practically the whole of the trunk, the upper arms, and the thighs, the distribution being "that of a man's bathing suit." On a few small areas thus involved could be seen pink, acuminate papules dotting the white skin. On October 7 the skin had a sodden feel, the exfoliation was considerable, and the patient complained of intense irritation. The neck and the skin about the mouth were now similarly affected. An ichthyol ointment was applied. On October 10 the condition had improved, the irritation was less. The scalp was extremely scurfy, and the forearms, legs, &c., showed some yellowish, horny, acuminate papules. From October 15 to 25 the patient was on small doses of thyroid extract, the ichthyol ointment being suspended. The skin was now very dry, wrinkled, silvery, but there was no exfoliation at this stage or later. On stopping the thyroid and re-applying the ointment, and giving an alkaline bath twice daily, with the administration of arsenic internally, the eruption began to subside. At this stage the face was brownish "like that of a Mexican"; the hands desquamated in the usual way about October 20. The child was discharged from the fever hospital on December 11, 1913, her trunk then showing several patches of normal skin. The father stated that the child had had an exactly similar attack in October, 1912; the eruption then lasted four months. Dr. Keane made the diagnosis of pityriasis rubra pilaris.

When the child was shown at the meeting of the Section the scalp was covered with branny flakes; the eruption on the face was evidently fading, but it had a scaly character. The neck and shoulders and the upper part of the chest were covered with an eruption of papules of the characteristic colour of pityriasis rubra pilaris, but in many parts the papules were of a flat type. Here and there were areas of normal skin.

On the neck and upon the sides of the chest there were discrete, acuminate, horny papules characteristic of the disease. The dorsal aspects of the proximal phalanges of the fingers were practically normal. The buccal mucosa was normal.

The special points of interest in the case were: (1) The possibility of the scarlatinal eruption being a scarlatiniform erythema at the onset of pityriasis rubra pilaris. The fact that the case was diagnosed as "scarlet fever" by an extremely competent observer, who had pityriasis rubra pilaris in his mind, and who definitely recognized the "second eruption" occurring as the first faded, may be taken to negative this view. On the other hand, there is the history of a previous attack in 1912. (2) The second point was the large number of plane papules which were present. Acute lichen planus was negatived by the colour of the eruption, by the presence of characteristic acuminate papules, together with the condition of the scalp and the face.

DISCUSSION.

The PRESIDENT regarded the case as one of exceptional interest as it might, on cursory examination, mislead the most experienced. At the first glance the lesions on the thorax irresistibly suggested a lichen planus, and the absence of characteristic lesions on the backs of the fingers might further lead one astray; but the appearance of the face, scalp and neck left no room for error. He could not doubt that the patient had suffered from scarlatina, and he was unaware of the occurrence of a prodromal erythrodermia in pityriasis rubra pilaris.

Dr. HALDIN DAVIS said he had had an opportunity of following up a case of pityriasis rubra pilaris which had been shown to the Section by Dr. Adamson. The patient, a little girl, had had two attacks, each having been associated with a rise of temperature and general erythrodermia, with a red tongue; and it was much debated at the hospital whether she should be signed up as a case of scarlet fever. It was decided not to do so. After each attack she desquamated. There was an interval of some months between the two attacks. He understood the explanation was that people who suffered from this condition were liable to periodic exacerbations. She still attended occasionally, and the original eruption still persisted.

Dr. DORE said he remembered a case in which there was a preliminary erythrodermic stage and in which the eruption on the abdomen was bright scarlet, resembling that of scarlatina. He believed that pityriasis rubra pilaris was recognized in fever hospitals as one of the conditions which might simulate scarlet fever. The patient who was shown at the Dermatological Society of London subsequently developed generalized sclerodermia.

Case of Radio-dermatitis ; (?) Tuberculide.

By W. KNOWSLEY SIBLEY, M.D.

[illegible]

positive, and the Wassermann negative. There does not appear to be any involvement of the lymphatic glands of the neck. A section taken from one of the outlying papules on the back of the neck showed a typical tubercular granuloma with a large number of giant cells present. Tubercle bacilli could not be detected.

The child is an orphan, and it has been impossible to obtain any very concise history, but I would suggest that the sequence of events was as follows: As a little girl, aged 4, she had a lupus vulgaris of the nose.



Case of radio-dermatitis of face ; (?) pigmentary tuberculide of neck. *a*, scar tissue ;
b, pigmentary tuberculide.

She was treated by an unprotected X-ray tube on several occasions. This was followed by a severe radio-dermatitis of the whole of the face, for which she was admitted into the hospital for about a month ; after this the condition was neglected for some time. The dermatitis subsided after many months, and has left this frightful disfigurement. At some period during the X-ray ulceration on the face, this became inoculated with tubercle bacilli, probably from the initial lupus on the nose, possibly from an extraneous source. The original lesion on the nose is cured, but a gradually spreading pigmentary tuberculide has persisted.

DISCUSSION.

Dr. WHITFIELD said he wished to protest against the nomenclature applied to this case. It would be agreed that this was a case of extensive lupus in which X-rays had been applied so strongly as to cause a dermatitis; but why was it called a tuberculide? Surely the name had been used as a convenient term to describe a certain class of eruption which was supposed to be caused by generalization of tuberculosis by the blood-stream. The characteristics of the tuberculides were that they were generalized, usually symmetrical, and non-progressive, that is, not serpiginous. Lupus, although of course also a tubercular eruption, had its own characteristics, and if it was to be called a tuberculide the term "lupus" must be dropped. He thought that the word tuberculide was generally used by the London school of dermatology in the sense which he had just mentioned, and that the term was analogous to that of syphilide as applied to the secondary symptoms of constitutional syphilis.

Dr. SEQUEIRA agreed with the remarks made by Dr. Whitfield. Hallopeau had differentiated between the toxi-tuberculides in which no bacilli were found and the bacillo-tuberculides in which the organisms were present. Dr. Sequeira objected to the application of the term "tuberculide" to a case such as this. There would be presently shown, by Dr. Gray, an excellent example of tuberculide, in which there was evidence of the dissemination of the poison, whatever its nature might be, through the blood. He considered the case to be one of lupus, spreading by satellite spots, the characteristic feature to which Hutchinson attached so much importance.

Dr. MACLEOD considered that it was unfortunate to designate the type of case exhibited as a tuberculide, and believed it to be a tuberculous condition more of the nature of lupus vulgaris. He referred to the confusion which had arisen in connexion with the term "tuberculide." The name "toxi-tuberculide" was employed by Hallopeau and Darier to describe certain eruptions which were known to be associated with tuberculosis, but in which bacilli had not been found in the skin and which were believed by them to be produced by toxins from tubercle bacilli situated in some distant focus. When the term "tuberculide" was used it signified toxic tuberculide in its original sense and was not in any way analogous with the much more widely applicable term "syphilide."

Dr. GRAY did not see why Dr. MacLeod should want to alter the term "tuberculide" because bacilli were found in the lesion. One did not want to alter the term "syphilide" because the spirochæte was found in the lesion, although when that name was first used the lesion was thought to be due to the toxin.

Dr. DORE agreed with Dr. Whitfield as to the nomenclature in this case, but found difficulty in accepting dissemination through the blood-stream as the

criterion of a tuberculide, on account of the fact that cases of multiple lupus following measles spread through the blood-stream and could not at all be due to inoculation.

Dr. WHITFIELD admitted that in the case of multiple patches of exanthematic lupus the tuberculosis was derived from the blood-stream in all probability, and in such cases the distinction did not apply so well, though the fact that these patches of lupus were serpiginous took them out of the class of tuberculide. At all events, such cases were rare compared with the ordinary non-progressive tuberculide. As regards the name "toxi-tuberculide," he thought that the term "tuberculide" originally meant a certain class of eruption connected with tuberculosis and derived through the blood-stream, and that the term "toxi-tuberculide" was an afterthought devised by those who thought that these eruptions were not bacillary in origin. It had been proved in many of the tuberculides that the bacillus was present locally in the eruption, and he believed that this was true of all the tuberculides. The fact that it was not always found proved nothing, as he would ask how many of those present had ever found the bacillus in ordinary lupus. Personally, while he had demonstrated the bacillus in a typical case of nodular tuberculide at that Section, he had never found the bacillus in ordinary lupus.

The PRESIDENT said the discussion had been of great practical importance and not merely of academic interest. He concurred with previous speakers in deprecating the nomenclature adopted by the exhibitor, and hoped that the Section would set the seal of its approbation upon the interpretation of the term "tuberculide" as being the result of a systemic infection and not a purely local tuberculous extension.

Dr. SIBLEY replied that he used the term "tuberculide" here in the sense he believed it to have been used in descriptions under the heading "pigmentary tuberculides." He hesitated at first to use the word pigmentary here, because the patient was such a dark subject. Members of the Section seemed to consider the term "tuberculide" should only be applied to lesions resulting from the dissemination of tubercle bacilli in the blood-stream, when there were scattered foci, excluding that term when it spread from one more or less localized focus, as in this case. He did not agree that the present lesions in this patient could be correctly called lupus, but that the pigmentary tuberculides often closely resembled some of the pigmentary syphilides, and that the same terms could be used.

Case for Diagnosis ; (?) Epithelioma.

By W. KNOWSLEY SIBLEY, M.D.

THE patient is a well-developed boy, aged 16, who for about two years has had a severe ulceration of the soft palate, accompanied by a discharge of a purulent nature from the right ear. His parents are both living and well. He is the youngest of three, and both the older boys are strong and healthy. His mother never had a miscarriage, nor is there any history of phthisis in the family. The Wassermann reaction at this time is stated to have been negative, and tubercle bacilli could not be detected in the expectoration. The local condition in the throat improved under iodide of potassium. For rather more than six months he has had an exuberant ulceration of the left alæ nasi with a well-marked, raised margin, which bled freely when touched. There was a very offensive discharge from this. There does not appear to be any involvement of the lymphatic glands. Three weeks ago the lesion on the nose presented the appearance shown in the accompanying photograph—one of a fungating, breaking down, very offensive tumour formation. On December 24 I applied rather more than a full Sabouraud's pastille dose of X-rays (unscreened), and within a very few days there was a very marked improvement in the character of the growth, and there has been a rapid retrocession ever since without any internal treatment.

I am indebted to Mr. de Santi for the following report as to the present condition of the throat: "There is old scarring of the soft palate and posterior pharyngeal wall, which I take to be either specific or lupoid. The uvula is gone, so also the epiglottis. There is a lupoid affection of the larynx, with swollen, pear-shaped arytaenoids and ulceration of the vocal cords."

No tubercle bacilli could be detected in the expectoration, but plenty of pus cells, squamous epithelium, streptococci, diplococci, and staphylococci. There are no definite pulmonary lesions at the present time, and the modified Wassermann reaction is positive, whereas the original Wassermann reaction is still negative. A section taken from the raised edge of the lesion on the nose under the left alæ nasi shows an ulceration with thickening of the stratum corneum—the basal layer is broken through and shows a marked prolongation downwards of the epithelium.

with distinct cell nesting. There is a marked pearl-like appearance of many of the deeper cells, together with a generalized cell infiltration and a dilatation of the vessels. No giant cells or tubercle bacilli can be detected.

DISCUSSION.

Dr. WHITFIELD said he thought it was probably a lesion of late congenital syphilis, though it would be necessary to remove the crusts to see, and this opinion was confirmed by the admitted fact that the Wassermann test was now positive. He saw no reason from the microscopic specimen to call the disease epithelioma, though the down-growth of epithelium was both marked and degenerate. He believed it was almost impossible to diagnose the true nature of the growth when only a superficial piece was examined. The matter was much simpler if the piece excised was to a depth of half an inch. With regard to the reported absence of giant cells, he found a typical pair of them in one end of the section, though he did not regard their presence or absence as of great diagnostic importance between syphilis and lupus. They were rarely present in epithelioma, unless it was epithelioma on syphilis or lupus.

Dr. MACCORMAC said the section appeared to have been cut obliquely, and that would largely account for the apparent hypertrophy of epithelium. He did not regard the cell changes as characteristic of malignant disease. The general appearances of the section suggested tuberculosis.

Dr. SEQUEIRA said if this was a case of epithelioma, it must be upon either a specific or a lupus basis. If upon lupus, it was very rare for epithelioma to develop so early in the course. He had seen many cases of epithelioma on lupus, but only after the lupus had existed for a long time, ten years being the shortest. The malignant supervention was more likely when a cicatricial condition had followed the ulcerative one and had persisted for a number of years. He regarded the present case as one of congenital syphilis. The point raised about the section for microscopical examination having been cut on the slant he regarded as important, particularly in sections taken from the nose, where the appearance of epithelioma was likely to be simulated. The fact that the Wassermann reaction was positive confirmed the diagnosis.

Dr. HALDIN DAVIS was strongly of the opinion that this was now, and had been, lupus. He thought both Dr. Whitfield and Dr. Sequeira were laying too much stress on a single positive Wassermann reaction. It was strange for the reaction to have changed from negative to positive in a boy between the ages of 14 and 16 unless he had acquired syphilis, of which there was no suggestion. The Wassermann reaction was one of the most fallacious in the whole of pathology; it depended on many things; on the particular modification which was performed, and who performed it. Ordinary lupus scarcely

reacted to X-rays unless applied in such a dose as to cause radio-dermatitis; but a fungating tubercular condition, which the photograph shown indicated to him, reacted well to X-rays, and the fact that the X-rays had caused such an improvement as was shown by the contrast between the condition as seen in the photograph and that now present was evidence that the disease was lupoid or tuberculous.

Dr. DOUGLAS HEATH agreed with the remarks made by Dr. Haldin Davis. Many tubercular lesions broke down in a similar manner. There were no other lesions or scars suggestive of syphilis. He had under care a typical case of congenital syphilis, with depressed bridge of nose and other stigmata, but the patient gave a negative Wassermann reaction.

Dr. MACLEOD did not consider that it was a true epithelioma, but simply a hypertrophy of the epithelium superimposed on some granuloma, either tuberculosis or syphilis. Of the two, he thought it was more probably tuberculosis, and he did not consider that the rapidity with which the lesion had developed was against that diagnosis, as he had seen lupus about the alæ nasi develop very rapidly.

Dr. DORE thought it was congenital syphilis, and he was the more inclined to that view because he had recently seen a patient with similar lesions of the palate and larynx and ulcers closely resembling those of scrofuloderma on the side of the neck. X-rays were applied without beneficial effect. The case was referred to the Throat Department, where it was thought to be lupus or syphilis. The Wassermann reaction was then found to be positive, and a complete history of early chancre and secondaries was subsequently elicited.

Dr. CORBETT pointed out that this lesion had improved under X-rays. His experience was that if one X-rayed a syphilitic lesion it either remained stationary or got worse if no other specific treatment were given at the same time.

The PRESIDENT remarked that when he looked at the case casually in the waiting room he thought it was a lupus. A further examination of the mouth and throat, however, led him to think that the patient had late hereditary syphilis. The difficulty in the differential diagnosis of such cases was notorious; and there was no reason why a congenitally syphilitic patient should not also suffer from lupus. He suggested an injection of salvarsan as a diagnostic, as well as therapeutic, measure.

Dr. SIBLEY replied that he was himself surprised when the modified Wassermann reaction was reported to be positive. The question was whether there was anything superadded. The section exhibited was not taken from the nose, but from the upper lip. He would bear the suggestion in mind about salvarsan, and report later.

Case of Acne Varioliformis in a Woman.

By GEORGE PERNET, M.D.

THE patient was a woman, aged 25, with extensive acne varioliformis of forehead and scalp of two years' duration. The disease was, in the experience of the exhibitor, unusual in women. This case did not respond to mist. ferri perchlor., which answered so well in the instance of an elderly man Dr. Pernet showed last year. But the present patient had done well on hydrarg. c̄ creta. Latterly a mild ung. hydrarg. ammon. had been ordered. The exhibitor stated that in the old days there was a tendency to look upon acne varioliformis as a condition connected with syphilis, and iodide of potassium was a favourite remedy. The Wassermann reaction was in this instance negative. Dr. Pernet did not consider the case had any connexion with syphilis.

DISCUSSION.

Dr. A. EDDOWES suggested that a culture be obtained from the pustules, remembering the possibility of different and mixed organisms appearing in these lesions. He referred to a rare form of acne which scarred rather superficially and in which, before the scarring appeared, there was hypertrophy. Each pustule first became raised and semicircular, then gradually broke down, leaving a small depressed scar. Such lesions might be termed molluscoid. He had carefully taken cultures from such a case and found only the acne bacillus and the *Staphylococcus aureus*.

The PRESIDENT demurred to the exhibitor's statement that acne varioliformis was formerly always considered to be syphilitic. He well remembered the elder Hebra's views on the subject, which were quite explicit. Long after their publication, Sir Stephen Mackenzie, in particular in this country, pointed out that there was a late syphilide which simulated acne varioliformis, and his observation held good. He thought that Sabouraud's investigations into the bacteriology of the disease were conclusive as to its nature.

Case of Disseminated Lupus Erythematosus.

By A. M. H. GRAY, M.D.

THE patient, a woman, aged 21, was first seen by the exhibitor in August, 1913. She had been admitted to University College Hospital under Dr. Charles Bolton for acute pneumonia. Her illness had commenced five days before admission, and coincidently with the onset of the pneumonia an eruption had appeared on the face, hands, and to a less extent on the arms and forearms, trunk and lower limbs: the rash was fully developed in about twenty-four hours. The eruption when seen on the day after admission was most marked on the face and consisted of a well-defined, raised, dark red erythematous area occupying the nose and cheeks, the typical butterfly area, but in addition to this numerous smaller areas were scattered about the chin, forehead and sides of the face, as shown in the illustration. The surface of the patches was smooth and shiny except in a few places, where some fine scales were present which were adherent, and when removed left a bleeding area. In addition three or four hæmorrhagic bullæ were present on the larger patch, the largest, about the size of a crown, being on the left cheek. The lesions on the hands were of similar character and most marked on the dorsum of the hands and fingers: here also two or three hæmorrhagic bullæ were present. The lesions on the other sites mentioned were of the same nature but smaller, not exceeding a pea in size: hæmorrhage had occurred into only a few of the lesions. The pneumonia ran its usual course, and the temperature fell by crisis on the sixth day after admission, continuing normal until the date of discharge, and the signs in the chest rapidly cleared up. Simultaneously the rash began to disappear rapidly and in a fortnight's time had almost disappeared. A von Pirquet's reaction done at this time was negative, and a blood count showed only slight diminution of red cells.

Since the patient's discharge from the hospital she has not been well and has had frequent slight recurrences of the eruption on the face and hands. In November she complained of pain in the chest, and on examination was found to have friction at the left base. She was readmitted to the hospital, but her symptoms cleared up immediately and she was discharged in a few days.

She was admitted again just before Christmas on account of a recurrence of the eruption, and was found to have a temperature of about 100° F. She had now been in the hospital over three weeks and her temperature had gradually fallen to normal in the last few days. She had been carefully examined to find any focus of infection but none had been detected. There was slight glandular enlargement



Acute disseminated lupus erythematosus with hæmorrhagic bullæ.

in the neck; no physical signs had been found in the chest, and an X-ray examination of the chest had also proved negative. Blood cultures had been made, but no organism had been grown. A few days ago another von Pirquet's examination had been performed, but this still remained negative. At the present time she had a few superficial, red, scaly patches on the face and hands showing typical lupus erythematosus characters, but there was no atrophy from the previously more severe lesions. She had had no medicinal treatment

in hospital until the last few days, when she was given quinine in small doses.

Six months previous to admission the eruption had appeared for the first time, mainly on the hands; it was unaccompanied by any general illness and cleared up in a few weeks. There was no definite history of tuberculosis in the family.

The case appeared to be of interest on account of the severity of the acute attack, and also in the apparent failure to demonstrate a tuberculous ætiology. It seemed to bear out the view that all cases of acute disseminated lupus erythematosus were not tuberculous.

DISCUSSION.

Dr. SEQUEIRA said an interesting point in the case was that the patient had pleurisy. In three successive cases of acute lupus erythematosus which he had recently seen pleurisy had been present, but in no case was there evidence that it was tubercular.

Dr. DOUGLAS HEATH said he had seen a case of the acute bullous variety of lupus erythematosus under the care of Dr. Short. The patient had chest symptoms—a gradually increasing pneumonia. There were large blisters on the ears and face, and the result was fatal. At the autopsy the retroperitoneal glands were very large, but not, as far as he remembered, definitely tubercular. It was not possible to test the material from the patient on a guinea-pig. The patient had had a temperature of 104° F. for several days.

The PRESIDENT thought that both Dr. Gray and the patient were to be highly congratulated on the successful result of the treatment by rest in bed. All the instances of the disease he had had under his care had terminated fatally. At the present time he had a woman, actually moribund in hospital, who had for months exhibited all the blood changes characteristic of pernicious anæmia. As she had very definite von Pirquet reaction it was probable that she also had tuberculosis. Throughout the case the eruption had been markedly purpuric and there were all the evidences of an especially virulent toxæmia.

Dr. EDDOWES said that in a case of the disease which had recently come under his care there was said to be no tubercular disease in the family, but the patient's father had died of pernicious anæmia not long ago.

Dr. GRAY replied that in a case he saw some years ago which was published by Dr. Pernet the retroperitoneal glands were enlarged, and were found to be tuberculous.

Case of Tuberculide.

By A. M. H. GRAY, M.D.

THE patient, a woman, aged 21, had suffered with tuberculous glands in the neck and axillæ from the age of 14, and had been operated on nine times for this affection. Previously to this she had suffered from ulceration of the eyes from the age of 8. The present condition was first noticed four years ago, red spots appearing on both hands after the last operation for glands in the neck; these spots went away in a few weeks, and did not reappear till eighteen months ago, since which time repeated crops had appeared on the hands and also on back of elbows and forearms and front of the knees. The spots were not painful, but irritated somewhat. At the present time the patient looked fairly healthy and appeared well nourished. The temperature and pulse were normal; enlarged glands were still present in the neck.

The skin lesions were of two kinds—hypodermic and dermic. The best defined hypodermic nodule was found over the left olecranon; it consisted of a hard nodule, the size of a small hazel-nut, slightly attached to the periosteum of the olecranon, but still movable over it, and quite unattached as yet to the skin. This nodule was excised under novocain ten days ago, and a section was shown under the microscope. On the other elbow and on both knees the later stages of the hypodermic nodules could be seen; these consisted of red indurated nodules covered by crusts, which, on removal, left a small sharply defined ulcer; also several sharply defined depressed scars were present in these situations. On the hands the lesions, at present, were situated mainly in the dermis. They consisted of small nodules from a pin's head to a pea in size, and were numerous, and situated mostly on the sides of the fingers. No active lesions were present on the palms or dorsum of hands, but some old scars could be seen on the palms. The nodules on the fingers, which showed the so-called chilblain circulation, were firm and well defined; in most cases they showed slight central necrosis, with the formation of a dry scab which subsequently fell off leaving a pitted scar; one or two of them were now capped by pustular blebs. Numerous old scars were also present on sides of fingers. The von Pirquet reaction was positive, inoculation being followed on the third day by a rise of temperature and a well-marked local reaction.

The nodule excised from the left elbow was divided into halves—one-half was inoculated into a guinea-pig, while sections from the other half were shown. The periphery of the section showed the inflammatory reaction practically limited to the blood-vessels, which were dilated, and showed both epithelial and perithelial proliferation and perivascular lymphocytosis. Within this were massed together round cells and connective tissue cells in great numbers, with an occasional giant cell and here and there a plasma cell. The centre had undergone necrosis. Tubercle bacilli had been stained for, but up to the present time none had been found.

The exhibitor wished to call attention to the fact that the first attack followed, by a few days, an operation for glands in the neck. He had seen another case in which a boy developed acne scrofulosorum after an operation on a tuberculous hip, and he wondered whether such a sequel was common; it was due, possibly, to a shower of tubercle bacilli being let loose into the circulation by the operation.

DISCUSSION.

Dr. SIBLEY asked why this was called a tuberculide, and was this the same as scrofuloderma?

Dr. WHITFIELD said it was not common to find large nodes of tubercle on the elbow. This was a very severe case. He had been impressed by the hopeless outlook of these cases. In his earlier days he thought these girls grew to the age of 25 or 30, and the disease slowly died away. But he had seen cases which had gone on with these nodes up to the age of 40 or 45. He would be glad to hear of any treatment which was of the slightest avail, because the subjects of it were usually in full health, except for that, and, perhaps, a chilblain circulation. He agreed that this was a typical tuberculide—i.e., a generalized symmetrical eruption, derived fairly obviously from one spot, via the blood-stream, after the operation. It was the most typical kind of tuberculide, in that the lesions did not show local extension to any marked degree.

Dr. GRAY replied that the main difference between the tuberculide and scrofuloderma was the fact that in the former the infection was through the blood-stream, and in the latter mainly through the lymphatic system. Scrofuloderma was due either to the bursting of tuberculous lymphatic glands through the skin or to a tuberculous lymphangitis with ruptured abscesses and chronic sinuses. The name had also been applied to some forms of extensive fungating lupus.

Case of Cutaneous Atrophy, with Comedo.

By A. WHITFIELD, M.D.

THE patient was a boy, aged 7, and the history was uncertain, as he was not brought by his mother. When seen there was a large area of abnormal skin covering the left temple and encroaching on the hairy margin. This area was formed of thin, white, atrophic tissue, studded closely with small pits, many of which were plugged with comedo-like bodies. It was said to have been noticed soon after birth. In addition to this there were smaller but otherwise similar areas beneath the chin, and these were of uncertain date. On the scalp there were two finger-shaped streaks of similar skin and comedo, which the woman who brought him said she was sure had been present for three weeks only. Over these patches the hair was lost. Here and there suppuration took place round the comedones. On the back of the head there was no loss of hair, but there were smaller plugs in the hair-follicles suggesting a milder form of the same disease. The boy had also ringworm, for which he had been brought to the hospital.

Dr. Whitfield had extracted one of the comedo-like bodies, and had made a crushed preparation, and had stained it. No comedo bacilli were seen, but there were one or two small colonies of bottle bacilli. The question arose: Was this really an active disease whose first symptom was the comedo, and which developed atrophy in consequence, or was the history unreliable and the case really one of congenital atrophy with secondary, so-called, "scar comedo"?

Dr. Whitfield reminded members that cases had been shown from time to time of excessive scarring and atrophy accompanying comedo; while, on the other hand, cases had also been shown, notably one by Dr. Adamson, of a comedo-like affection which was really a keratoid nævus. In spite of the fact that a small amount of suppuration was present around some of the comedones, Dr. Whitfield inclined to the belief that the atrophy was the primary, and probably congenital, lesion, and that the comedo-like bodies were merely irregular cornification. The chief objection to this view seemed to be that the process appeared to be beginning also on the back of the head, but this might be really merely a slighter degree of the affection, and not the initial stage of the severer type.

DISCUSSION.

Dr. DORE said members were familiar with the multiple comedones of children, which were thought by Radcliffe Crocker to be due to wearing dirty caps. There was another group in which comedones and inflammatory acneiform lesions were caused by rubbing in camphorated oil or other greasy preparations, and he asked if the lesions in the present case could be due to a similar cause.

Dr. EDDOWES suggested that the lesions might be due to infection by instruments at birth.

Dr. WHITFIELD replied that though Dr. Dore's suggestion was an alternative diagnosis, he did not think it likely in this case. The condition was noticed almost immediately after birth. The skin was whitish and of altered texture, suggesting atrophy.

Dermatological Section.

February 19, 1914.

Dr. J. H. STOWERS, Vice-President of the Section, in the Chair.

Case of Congenital Milium in a Male Infant, aged 3 Months.

By E. G. GRAHAM LITTLE, M.D.

THE condition as seen had been noted at birth and had increased since then. At the present time the patient had a very copious eruption on the face, especially on the chin, where the whole surface was closely studded with the characteristic small white tumours; in the axillæ and on the chest and back, and scalp, there being many hundreds of the lesions. The mother had no milium, and this was the only child affected. The exhibitor had to thank Dr. Seymour Lloyd, of Luton, for the case.

Case for Diagnosis (? Sclerodermia).

By E. G. GRAHAM LITTLE, M.D.

THIS was probably a case of sclerodermia in a lady sent to the exhibitor by his colleague, Mr. Edmund Owen, with a curious history. She had been seen fifteen years ago, shortly after the first appearance of the disease, by Mr. Jonathan Hutchinson (as he then was), and by Dr. Payne. The former had pronounced the case to be "lardaceous disease" of the skin, whatever that might be. Dr. Payne had called it "papyrus skin," and the patient had been painted for an atlas. At the present time she had on each shoulder at the upward slope of the neck and on the neck itself a large patch about $2\frac{1}{2}$ in. by 2 in. of atrophied, wrinkled, and slightly reddened skin, with no shiny surface as in sclerodermia, but on the contrary with a surface like crinkled

tissue paper. This patch had been "white like a blister"; lower down on the back, at the level of the spines of the scapulæ, there were two groups of depressed pea-sized scars, one on each side, with a striking resemblance to the scars and grouping of herpes zoster. These had originated in exactly the same way as the lesions on the upper part of the shoulder. There was occasionally slight itching of the parts affected, but no other subjective sensations were complained of. The patient was now aged 65 and otherwise in excellent health. She had had no treatment other than local ointments for relief of itching.

Case of Favus of the Glabrous Skin of the Right Side of the Neck in a Girl, aged 11.

By E. G. GRAHAM LITTLE, M.D.

THE patient was one of a family of three children living together in a mews in Paddington, the father being a carman. The disease had shown itself about a month ago and had been seen then with a very small, slightly scaly patch which had been thought at first sight to be a tinea, but the demonstration of the characteristic fungus of favus had established the diagnosis. The patch was left untreated for a week and the child had then come up with a typical yellow scutulum in the middle of the scaly patch. At this stage she had been shown to the Harveian Society at its meeting at St. Mary's Hospital. Pure cultures from the scutulum were grown on Sabouraud's proof medium, and gave the typical aspect of *Achorion quinckeanum*. The cultures grew very rapidly at a temperature of 32° C. It was notable that at the temperature of a sitting room, in which was kept another Sabouraud tube, sown with the same fungus at the same time, the growth was totally different, being a slimy grey-white patch, which, however, gave characteristic spores but no mycelium.

Achorion quinckeanum had hitherto been identified as a mouse-favus, and the possible source of the infection was closely investigated. The child had been kept at home on account of a sore throat for about two weeks before the first appearance of the patch. The infection was therefore probably derived from the home. Here there were seven canaries and two cats sharing the domicile. The canaries, being a source of profit, were carefully tended and the affected child handled the birds at different times. The cats, when not at large in the stables

below, were chiefly confined to a large coal-box in which mice were thought to be present, but the rooms were not at any time over-run by these. The canaries were inspected by the exhibitor, and the feathers from one bird, which was moulting, were examined microscopically, with a negative result. The cats had now been removed and in their absence an attempt would be made to catch some mice and investigate this possible source of the contagion. Neither of the other children, who were both younger than this patient, showed the disease, and there was no affection of the scalp in this patient.

DISCUSSION.

Dr. SEQUEIRA said he saw very few favus cases now in East London.

Dr. MACLEOD said that some little time ago he had shown to the Section a case of favus of much the same type and grew from it the quinceanum fungus. He had seen the case in much the same phase as in this one and also in an earlier stage in which small pinhead-sized scutula were present.

An Unusual Case of Syphilis.

By J. E. R. McDONAGH, F.R.C.S.

THE patient, a man, aged 41, came up for consultation in October, 1913, complaining of a rash on the penis. Nineteen years ago the patient had a sore on the skin of the penis. The sore appeared some weeks after connexion, remained single, was about the size of a sixpenny-piece, the ulceration was superficial, the sore did not increase in dimensions, there was little or no discharge from it, and it took some months to heal. A medical man was consulted at the time, who ordered local treatment only, and as far as can be ascertained, no diagnosis was made. The sore was not followed by swelling in the groin and no other symptoms appeared until early in 1913. In the meantime the patient had always enjoyed the best of health, except for occasional attacks of dyspepsia which still troubled him.

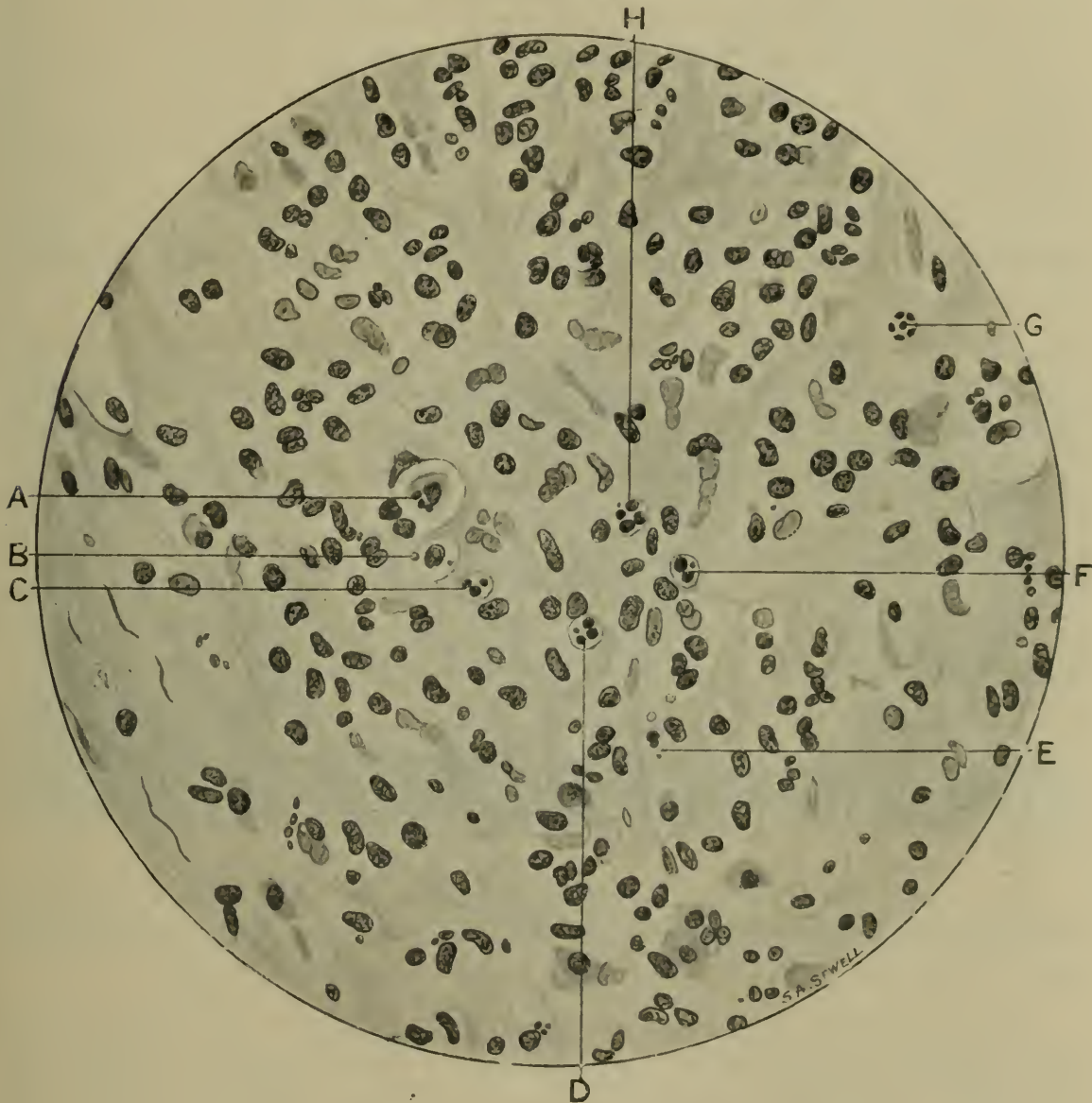
The patient had spent some time in West Africa, but the sore appeared in England before he had visited the Tropics. He was married, but had had no children and his wife had never been pregnant.

The rash for which the patient sought advice was a ringed eruption in the circumference of the original sore and a smaller similar lesion which appeared later, below, and somewhat to the outer side, but quite separate from the first lesion. There was a scar where the original sore had been, around which was a raised ring made up of almost discrete papules. Some of the papules appeared to have a little pus in them, but no matter came away upon puncturing them. Other papules were covered by a small hard crust, which when removed showed a scar but no ulceration. The lesion below was similar, and with neither was there any surrounding inflammation.

The exhibitor had no doubt in his own mind but that the lesions were syphilitic and that the original sore was a primary chancre. The patient had never shown any other symptoms of syphilis; he had never taken any treatment, and on a thorough examination no other signs of syphilis were revealed. The Wassermann reaction was slightly positive (+ +). The patient then received four weekly intravenous injections of neo-salvarsan, some intramuscular injections of mercury and potassium iodide internally; local applications of ung. hydrarg. and ung. iodex were also prescribed. In spite of all this treatment the lesions are very much the same to-day as when they were first seen, and the Wassermann reaction remains indefinite (- +).

Clinically the condition was unlike anything else except syphilis, but as it was odd that antisiphilitic treatment had proved unavailing, I removed a portion for microscopic examination. Several sections were cut and stained. In all, the bulk of the cellular infiltration was limited to the corium and any inflammation in the subdermic tissue was in and around the walls of the blood-vessels. The cellular infiltration was mainly composed of lymphocytes and plasma cells. In some sections the cellular infiltration was grouped into small areas, which were surrounded by connective tissue. In some areas several giant cells were to be seen, which might have suggested a tuberculous lesion, but in other areas necrosis had taken place, leaving behind an amorphous mass which stained badly, suggestive of either caseation or more probably a gumma. Any vessels visible showed marked cellular infiltration, both in their walls and in the perivascular tissue. In other sections the cellular infiltration was diffuse, there were more plasma cells, no giant cells were visible, and the various phases of the *Leucocytozoon syphilidis* were clearly discernible. The peculiar features about the phases were the entire absence of any male and female bodies and the preponderance of intracellular and extracellular developing spores.

Against the view that the gametal forms had been destroyed by the treatment was the fact that the lesions had remained unaltered in spite thereof. The suggestion arose that the case was an aberrant form of syphilis in which only the spores had been able to develop asexually.



A, development of trophozoite in connective tissue cell. Note degenerated nucleus of connective tissue cell above and to the left. B, C, D, F, H, sporoblastic development. Note in D, F, H, the tiny body, which is probably a blepharoplast, which has remained behind, suggesting a parthenogenetic development. E, sporoblast and sporozoite. G, spore-cyst.

In favour of the suggestion were the following points : (a) the chronicity of the lesions ; (b) the extreme localization with no ascertainable symptoms of there ever having been a generalized infection ; (c) the

weak positive Wassermann reaction; (d) the inability of treatment to cure the lesions. Clinically the case was of extreme interest and likewise the histological appearances. Unless one had been able to find the syphilitic parasite it would have been impossible to diagnose the condition from any other form of granuloma. Another point of interest in the case was that the wound resulting from the biopsy healed by first intention, while the site of the original sore broke down and ulcerated again. The ulceration healed in three weeks. The tendency for sites of primary sores to break down years afterwards as a result of trauma was very characteristic.

Finally, it might be stated that the parasitic bodies gave the same microchemical and physical tests as the exhibitor had described elsewhere.¹

The other possibility was that the extracellular spore formation resulted from female gametes, which had developed parthogenetically. The maintenance of the blepharoplast in many of the cells was suggestive of this view.

DISCUSSION.

Dr. SEMON thought this would be a very good case on which to try the luetin reaction, if the Wassermann reaction was doubtful.

Dr. WHITFIELD asked if the tuberculin reaction had been tried on the patient; or if guinea-pig inoculation had been done. It might be tubercle, and there was no evidence that it was syphilis, except the doubtful Wassermann reaction.

Dr. GRAY did not think the luetin reaction would help matters, because it might give a positive result in any patient who had had syphilis, however long ago, and did not prove that the present lesions were due to syphilis.

Dr. HALDIN DAVIS thought it would be interesting to try the effect of the luetin reaction, in view of the need for more evidence that the condition was syphilitic. At present the diagnosis had to rest on a doubtful reaction and upon microscopic specimens which might carry conviction to some minds, but not to others.

¹ *Biochemical Journ.*, Liverp., 1913, vii, pp. 517-48.

Epithelioma Adenoides Cysticum of Brooke in Mother, Daughter, and two Sons, associated with so-called "Multiple Endothelioma of the Scalp"; its Relationship to Multiple Rodent Ulcer.

By H. G. ADAMSON, M.D.

UNDER the name "Epithelioma Adenoides Cysticum," Brooke, of Manchester, in 1892, had described in the *British Journal of Dermatology* four cases of multiple cutaneous tumours occurring mainly about the face, of epitheliomatous structure, but of benign nature.



FIG. 1.

Epithelioma adenoides cysticum in mother and daughter. Reproduced from Dr. Brooke's original paper in the *British Journal of Dermatology*, 1892, iv, p. 269.

For many years this affection had been confused with another type of multiple benign tumour of the skin which was described by Kaposi under the title of "Lymphangioma Tuberosum Multiplex." But it had been conclusively shown by Unna that Brooke's affection was quite distinct from the Kaposi type both in its clinical and in its histological features, and that Kaposi's so-called lymphangioma was really an embryonic sweat gland tumour, and it was now generally known as Syringoma. Its common site was over the front of the upper part of the chest, and not about the face as in Brooke's disease. Brooke's affection was now described as a multiple benign trichoepithelioma (fig. 1).

Some confusion had also arisen between these two affections of Kaposi and of Brooke and a third type of benign epithelioma which occurred commonly upon the lower eyelid and in which the growths were generally few or single. This third affection was first described by Jarisch in 1894 as "Hæmangio-endothelioma," by Darier as "Hidradenoma" and again by Werther in 1898 as "Tricho-epithelioma." McDonagh had recently studied these growths of the lower eyelid, and stated that they might contain lanugo hair-follicles, sebaceous glands or sweat glands, or undeveloped forms of these organs,

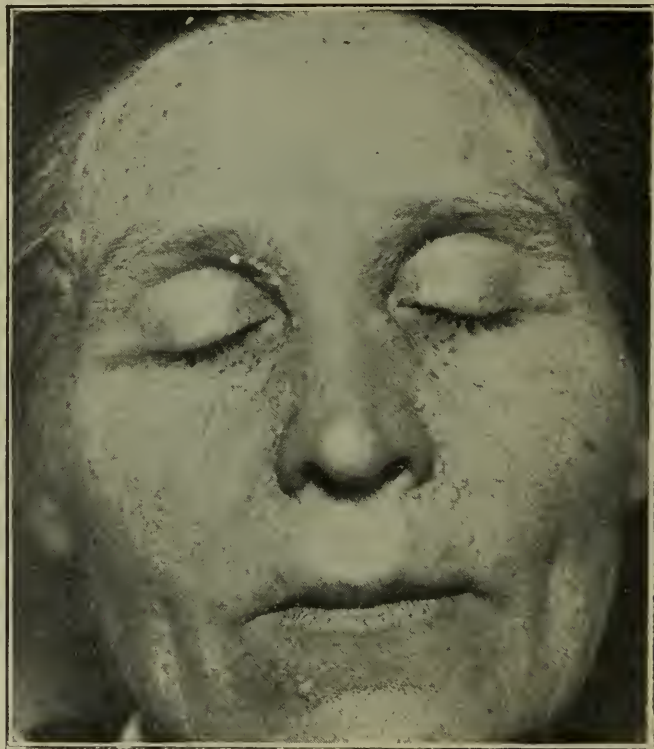


FIG. 2.

Case I.—*Epithelioma adenoides cysticum*. Numerous rounded nodules about the eyelids, at the sides of the nose and scattered in other parts of the face. Rather larger nodules on the temples, forehead and scalp.

that was to say, tricho-epithelioma, sebaceous adenoma, or syringoma. Often two or more of these types were found in one tumour. He regarded them as reversions to the face glands seen on the lower eyelids of deer and other animals.

The lower eyelid tumours were of common occurrence; the multiple tumours of Brooke and the syringoma or lymphangioma tuberosum multiplex of Kaposi were rare.

The cases now shown were typical examples of Brooke's affection. They were of great interest on account of their close resemblance to multiple rodent ulcer in their clinical features, their histology, and in the distribution of their lesions. A further interest was the fact that two of the cases presented those tumours of the scalp which had been called "multiple endotheliomata," but which had been shown by Dubreuilh to be basal-celled epithelioma, and which were demonstrated



FIG. 3.

Large nodules on the scalp in Case II associated with nodules on the face similar in size and distribution to those in patient's mother (Case I).

by the examples before the meeting to belong to the group of cases described by Brooke as "*Epithelioma Adenoides Cysticum*."

Case I.—F. W., aged 45, housewife. The eruption was first noticed between the ages of 35 to 37. It had increased gradually, and more noticeably after confinements. The eruption consisted of raised rounded nodules, situated in groups: (1) In the naso-labial furrow; (2) at the inner side of the orbit; (3) on the temples. There were scattered nodules on the forehead and cheeks, on the sides of the neck and behind the ears, on the scalp and on the

shoulders (fig. 2). The nodules were raised, firm, hemispherical, of the colour of the skin, or in the case of the larger nodules, dusky red. Minute vessels could be seen running over the large nodules. They all had much the appearance of the "rolled edge" of a rodent ulcer, but none were ulcerated or crusted, and there were no scars. The nodules on the temples, at the inner orbits and in the naso-labial furrows were small, pinhead to split-pea-sized, and closely packed, with here and there a larger nodule. On the scalp there were many small nodules and three were as large as a small nut or marble. There were several milia on the lower eyelids. A pea-sized nodule had been removed from the forehead for microscopical examination.

Case II.—R. W., aged 21, was the eldest son of F. W. He presented similar nodules on the face, in the same areas, and also several much larger

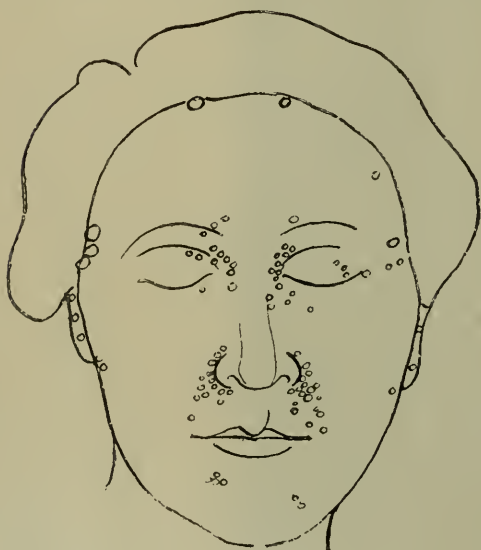


FIG. 4.

Fig. 4.—Diagram of Case I showing distribution of the nodules, for comparison with fig. 5.

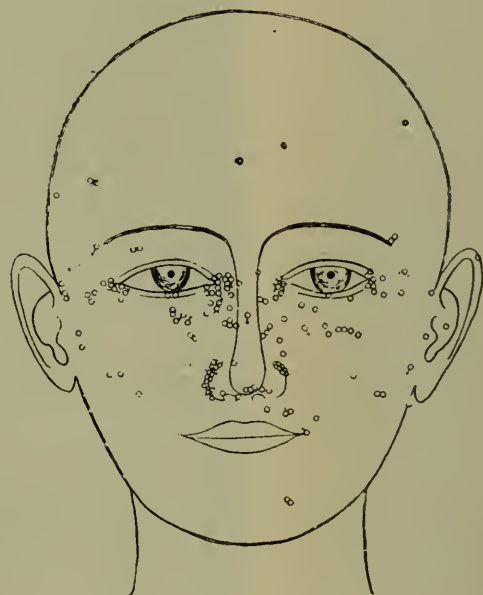


FIG. 5.

Fig. 5.—Reproduction of Dr. J. H. Sequeira's diagram of the distribution of 220 rodent ulcers, for comparison with fig. 4.

spherical nodules on the scalp and one nodule on the chest below the right clavicle. The nodules on the scalp were as large as unpeeled walnuts and prevented him putting on his hat except at an acute angle. The largest of the nodules on the scalp had appeared three years ago and had rapidly increased to its present size (fig. 3). The nodules on the face had not been noticed until two years ago. The largest nodule and several smaller nodules had been removed from the scalp and examined microscopically.

Case III.—A second son, aged 19, had recently developed nodules on the scalp, but none had been noticed on the face.

Case IV.—I. W., aged 10, daughter of F. W., had a single pinhead-sized nodule on the left naso-labial furrow and one on the forehead. Several smaller nodules could be seen on the cheeks and on the sides of the nose.

The mother of this family stated that she had eight children living, and four of these were affected thus: Girl aged 4, boy aged 7, boy aged 9, unaffected; girl aged 11, a few; boy aged 14, boy aged 16, unaffected; boy aged 19, boy aged 21, both affected. Her mother and one of her maternal aunts had been affected.

In the *Lancet* of October 17, 1908,¹ the exhibitor had published some cases of multiple rodent ulcer and had pointed out the clinical and histological resemblances of multiple benign cystic epithelioma and multiple rodent ulcer. A comparison of the distribution of the lesions



FIG. 6.

Section from margin of a tumour, Case I (fig. 2); shows tricho-epitheliomatous growth at centre of drawing and sebaceous gland towards the right.

in the case of the mother (fig. 4) with Dr. J. H. Sequeira's well-known record of the distribution of 220 cases of rodent ulcer (fig. 5) showed a striking similarity in areas affected by rodent ulcer and multiple benign tricho-epitheliomata.

But it was not only in their appearance and distribution that these tumours resembled multiple rodent ulcer: their histological characters were also closely similar, so that a section of one of these growths might be pardonably mistaken for one of rodent ulcer. The drawings exhibited (figs. 6, 7, 8, 9) showed that the lesions were made up of oval

¹ *Lancet*, 1908, ii, pp. 1133-38.

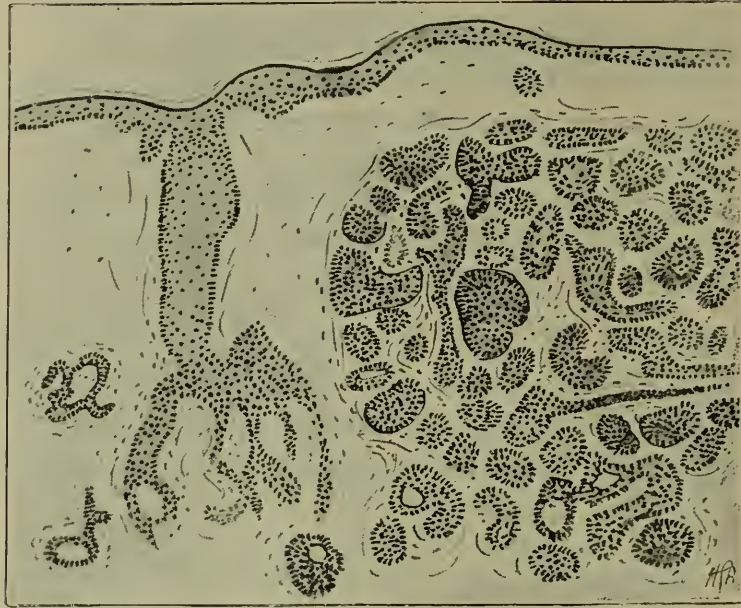


FIG. 7.

Section from nodule on forehead in Case I (fig. 2); masses of oval cells which recall the cells and their arrangement in rodent ulcer.

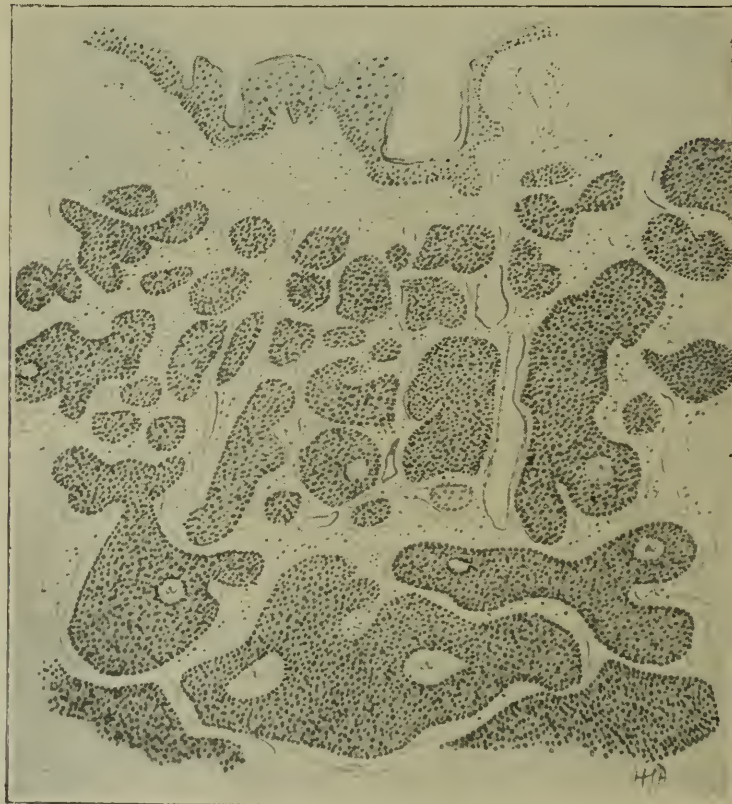


FIG. 8.

Rodent ulcer-like growth from one of the nodules of the scalp in Case II (fig. 3). The connexion of the growth with the hair-follicles in some parts, in others with the basal cell layer of the epidermis, is not shown in this drawing.



FIG. 9.

Section (high power) from large nodule in Case II, showing lobules made up of oval cells with large nuclei and little or no visible protoplasm. The section shows also the hyaline bodies described by Dubreuilh in sections from a similar case of benign epithelioma of the scalp.



FIG. 10.

Section from a benign lower eyelid growth present since infancy in a man, aged 37, who now had a typical rodent ulcer of two years' duration on the nasolabial furrow. The resemblance of the benign growth (basal-celled epithelioma) to that of rodent ulcer is striking.

cells derived from the basal cell layer of the epidermis, and in the case of one section (fig. 6) there was a suggestion of origin from the pilo-sebaceous follicle. The cells were arranged in lobules with a marginal palisade layer and here and there cystic formations similar to those seen in rodent ulcer. Of special interest was fig. 8, which represented a section from one of the nodules on the scalp of the elder son. It was easy to see how these lesions had been mistaken for endothelioma; but at the same time their resemblance to rodent ulcer was obvious.

As a corollary to these cases the exhibitor showed a drawing (fig. 10) from a section of a congenital lower eyelid tumour in an adult who had also a rodent ulcer in the naso-labial furrow. The lower eyelid tumour was clearly a basal-celled epithelioma and its resemblance to rodent ulcer was striking.

The inference drawn from these cases was that rodent ulcer was a naevoid growth, similar in nature to the benign epitheliomata, but differing in that the latent embryonic foci were aroused from their dormant state at a later period of life, when the cells composing them had retained only their function of proliferation, and had lost their power of differentiation. It was well known that late in life there was a tendency to growth of coarse hairs in the eyebrows and nostrils and elsewhere, and this corresponded with the stimulus to growth of latent embryonic pilo-sebaceous follicles which led to rodent ulcer.

DISCUSSION.

Dr. A. EDDOWES mentioned a case which he showed many years ago, with drawings, at the British Medical Association meeting in Oxford. He had shown the drawings on several occasions since. In his sections he fortunately got staining of the contents of the cystic tubules, which showed a very large number of organisms which were all similar, and had the appearance of minute bacilli in chains, or a small streptococcus. He suggested that every attempt should be made to get cultures from the present cases. Possibly we had here a special organism which had not yet been studied. He believed that the lesions were infective. The patient shown at Oxford had to leave for India, but before he left he removed nearly all the nodules, and there was no recurrence while the patient remained in England. He had since lost sight of the man, whom he advised to see a surgeon on arrival in the East and have the condition watched, because if neglected a fungating process might be set up, or ulceration similar to that of rodent ulcer.

Dr. MACLEOD asked if it was Dr. Adamson's idea that rodent ulcer was invariably a tricho-epithelioma.

Dr. WHITFIELD said that the diagrams which Dr. Adamson had shown were so striking that one could not neglect the similarity of site between tricho-epithelioma and rodent ulcer. He thought, however, that Dr. Adamson's explanation of the growth of tricho-epithelioma and rodent ulcer respectively was not entirely satisfactory. It was true that rodent ulcer did not often form a good tumour, but this was because it broke down into an ulcer. Actually rodent ulcer made a larger amount of new tissue than did tricho-epithelioma. One could hardly say that tricho-epithelioma was a more robustly growing tumour than rodent ulcer, since the latter seemed the more powerful both as regards producing a greater amount of new growth and invading the tissues of the host.

Dr. SEQUEIRA regarded the communication as very interesting, and especially the suggestion of Dr. Adamson that the rodent ulcer was derived from the rudimentary hair-follicle. In the important debate on rodent ulcer at the Pathological Society in 1894¹ Dr. Colcott Fox and others placed the origin of rodent ulcer in the hair-follicle. Dubreuilh and Auché also traced the origin in many cases to the pilo-sebaceous follicle. The point raised by Dr. Whitfield he regarded as a good one, because the tumours on the scalp were composed of masses of fairly innocent growth, and were distinct from the growth met with in the case of rodent ulcer when attacking the scalp. Rodent ulcer on the scalp was usually of the superficial cicatrizing type; it did not produce large growths or deep infiltrations. Dr. Adamson's suggestion that multiple rodents may start from congenital anomalies was very important. The speaker had been interested in the origin of many rodent ulcers in early life, and had reported several cases. Recently he saw a case in which the rodent ulcer began as a growth which was described as being a bluish "pimple" at the age of 11; the patient was now only aged 20, and for the last four years he had had a typical rodent ulcer. The old idea that rodent ulcer was always a growth of old age must be abandoned. The early cases were usually diagnosed as lupus.

Dr. ADAMSON said, in reply to Dr. Whitfield, he had not intended to suggest that the growth of rodent ulcer was less abundant than that of benign tricho-epithelioma. It was probably more active but less stable, for the cells which made up a rodent ulcer had retained their power of active proliferation, while they had lost their tendency to develop into a special type. They thus formed an unstable mass which readily ulcerated and which also did harm to the healthy tissues by its presence and growth amongst them.

¹ *Trans. Path. Soc.*, 1894, xlv, pp. 176, 180.

**Generalized Lentiginous Pigmentation in an Adult ; (?) Adult
Urticaria Pigmentosa.**

By H. G. ADAMSON, M.D.

A. B., AGED 44, had noticed the eruption gradually increasing during five years (*see figure*). Everywhere on the skin, except of the face and of the palms and soles, there were freckle-like pigment stains, of a dark red-



Case of generalized lentiginous pigmentation of five years' duration associated with attacks of urticaria ; (?) adult urticaria pigmentosa.

brown colour, profuse and closely set on the limbs and trunk, and sparse upon the backs of hands and feet. The patient had stated that the skin itched after meals and that there appeared clusters of wheals, on the legs especially, but also on the arms. In her own words, "white blisters puff up in bunches after eating or drinking." There was no factitious urticaria, but the exhibitor thought that the macules on the arms could be made to swell slightly on friction, though this swelling was not very obvious. A microscopical section of a macule showed only some increase of pigment granules in the lower layers of the epidermis and a very

slight round cell infiltration around the blood-vessels in the corium, with a few mast cells, but not more than in any inflammatory cell exudation.

The case recalled one of a similar nature, in a medical man, shown by Dr. Douglas Heath at a previous meeting of the Section.¹ The exhibitor had observed five other closely similar cases, one in a young man, aged 22, and four in women, aged 28, 44, 50, and 52. The duration of the eruption when seen had varied from one and a half to five years. In all cases there had been a profuse eruption of dark red-brown freckle-like macules, chiefly upon the arms and legs, and, generally, also upon the trunk, but never upon the face and neck and sparsely or not at all upon the hands and feet. The red colour of the macules faded on pressure, leaving a pale brown stain. In one case only was there a distinct urticarial swelling of the macules on friction. In the remaining cases it was slight, doubtful, or absent. In four cases pruritus was complained of and there were occasional urticarial attacks apparently independent of the macules. There was never factitious urticaria or dermatographism. In one female case there was a trace of sugar in the urine. Two cases had been diagnosed as syphilitic eruptions, and one patient, the young man, had been rejected as a candidate for a post in a Government office on that account.

The exhibitor asked whether these cases were to be regarded as adult urticaria pigmentosa or, as Dr. Whitfield had suggested when Dr. Douglas Heath's case was shown, as a distinct disease.

Dr. Graham Little had pointed out in his monograph on "Urticaria Pigmentosa" that records of the disease beginning in adult life were more numerous than generally supposed. He gave a list of twenty-two published cases in which onset had taken place after puberty.² Many of these seemed undoubted examples of urticaria pigmentosa.

DISCUSSION.

Dr. WHITFIELD considered this a case of an unnamed disease distinct from urticaria pigmentosa. He remembered a case under his care which he had failed to diagnose. This case went on to someone else, and was subsequently shown with the diagnosis of urticaria pigmentosa. The patient then returned to Dr. Whitfield and a biopsy was made, but the tissue showed nothing characteristic. He asked if anyone knew of a case of well-marked urticaria

¹ *Proceedings*, p. 24.

² *Brit. Journ. Derm.*, 1905, xvii, pp. 355-73.

pigmentosa in which the excised lesion did not show any of the characteristic mast cell infiltration.

Dr. ADAMSON replied that all these cases were diagnosed as secondary syphilis at some time or another. Sometimes there was a history of four to five years' duration.

Case for Diagnosis (? Sclerodermia and Keloid).

By J. A. NIXON, M.B.

THE patient is a female, aged 31, single, who has been engaged as a nurse at various asylums and workhouse infirmaries for eight years. Nearly four years ago she noticed some irritation over the sacrum and discovered a large discoloured patch of skin which was about 14 in. in diameter. The skin was of a reddish-brown tint, gradually growing browner, and the area spread slowly at its margins. She does not know when the second or upper patch first started. Her health has always been excellent; she is not aware of any injury or abrasion at the onset of this disease. She has a moderately enlarged thyroid gland, without any symptoms of Graves's disease; but her sister has suffered from this complaint. She complains at the present time of persistent sciatica in the right leg, for which no cause can be found. The lesions consist of (a) a large slightly depressed area, roughly circular in outline, occupying the centre of the back; extending above from the level of the angles of the scapulæ to the mid-lumbar region below and laterally almost to the flanks. This area is of a dull reddish-brown colour, the texture of the skin is scarcely altered, the margins are irregular, and there are outlying small islands of affected skin. In the centre of this area is a small patch of (b) white scar tissue, showing the superficial trabeculation of keloid. (c) Situated over the sacrum there is a transverse patch of a similar character to (a), extending laterally to the middle of each iliac crest and about 4 in. in depth from above downwards. In this area there is no scarring or change of texture in the skin, but the colour is altered to a paler and more parchment-like tint, and many dilated venules are present. On the lower abdomen and on the hips are small brownish-red macules $\frac{1}{2}$ in. to 1 in. in diameter; these are neither depressed nor infiltrated and they are, according to the patient, the earliest manifestation of the disease. The progress of the lesions seems to be a gradual centrifugal extension of these macules, with eventual depression of the surface of the affected skin and a slight thinning of its texture. The

areas become dusky red and present an appearance resembling a slightly nævoid condition. Finally, in some of the areas the centres become white and atrophic, with occasional dilated venules. At no time has any sclerodermic thickening or stiffening of the skin been observed.

A portion of the skin was removed for biopsy and reported on as follows by Professor Walker Hall. "Cultures: *Micrococcus epidermidis* only. Section: The epidermal papillæ are generally atrophic; the stratum granulosum is defective and almost absent; the Malpighian layer shows immature and badly formed cells. The whole epidermis is compressed apparently by a very dense and fibrous dermis. In this dermis there are perivascular and periglandular mononuclear-celled infiltrations. There are not any signs of exudative or granulomatous inflammatory reactions. The arrangement of the cells and of the fibrous tissue suggests some relation to the vascular system." Wassermann reaction negative.

The case appears to be an atypical one. In certain features—the faint reddish-brown pigmentation, the telangiectases, the occasional morphœa-like scar, the spontaneous development, the distribution, and slow spread—the condition resembles *sclerodermia*. In other features—the absence of any stage of induration, infiltration, or want of pliability in the skin—the connexion seems to be somewhat nearer to an *idiopathic progressive skin atrophy*, but it is noteworthy that the affected areas are not denuded of hairs, nor is sweating absent. Finally, the formation of a *keloid* patch in the centre of the largest area cannot be disregarded. In my opinion, the disease is a form of *sclerodermia*, related (as many of these cases are) to some alteration in thyroid function. Addison's account of *sclerodermia* under the name "true keloid" seems to provide the best explanation of such an anomalous case, where the sclerodermic process has stopped short of the stage of hardness and rigidity. I am inclined to adopt his view that there is "some morbid change taking place in the subcutaneous areolar tissue . . . very nearly allied to inflammation, probably of a strumous nature." I think we must look for the explanation of these anomalous cases not so much in the direction of a new and undescribed infective agent as in the direction of some variation in the behaviour or reaction of the tissues and cells of the individual to toxins and infections. In this instance the determining factor may very well be a derangement of thyroid activity, and, acting on this supposition, I have treated the patient with thyroid extract. Since this treatment was begun there has been a marked arrest of the spread of the lesions. Unfortunately, the

biochemical investigation of disease is, as yet, only in its infancy, and the problems of dermatology have not yet come under that systematic investigation from this standpoint which is, I believe, destined to explain many things at present incomprehensible.

DISCUSSION.

Dr. BOLAM suggested that the patient's skin should be tested in its reaction to blistering or a hot bottle. He regarded it as a suspicious lesion, probably an artefact. Her occupation gave her the opportunities for observing effects of that kind.

Dr. ADAMSON said the suggestion made by Dr. Bolam that it might be an artefact occurred to him also, chiefly owing to the peculiar shape of the lesions. He thought the eruption and the scars were possibly produced by applications of hot fomentations or a hot bottle.

Dr. EDDOWES pointed out that there was often a great variation in sclerodermia. He had seen, in the same patients, typical patches of what would be called sclerodermia and others which would be called *morphœa alba*, and large patches of melanodermia and leucodermia. They were almost certainly only stages in the same pathological process.

Dr. F. PARKES WEBER agreed that the possibilities of artefaction should always be borne in mind, but he regarded this case as one of the least likely cases to have that causation. He thought it inconceivable that such a condition could have been produced artificially; the distribution, and the uniformly slightly depressed surface, of the pigmented areas were very remarkable. Then there was the absence of any redness, except about the site of the recent biopsy examination. If the condition were the result of artefaction one would have expected, at some time or other, redness and scarring of the affected surface.

Case of Acanthosis Nigricans.

By J. A. NIXON, M.B.

THE patient is a female, aged 39, single, who noticed that her skin was becoming covered with small warts during the summer of 1913. There was a subjective sensation of itching and sometimes a sharp, stinging feeling in the skin. The whole surface of the body, including the limbs, trunk and face, is covered with an eruption of sessile papillomata, varying from the size of a pin's head to a split pea. Some of the papillomata are so minute that they present the appearance of the shining scales of lichen planus. Since the eruption of the warts dark marks have appeared on the neck and in the folds of the joints, which

were thought to be dirt. The skin of the neck, axillæ, elbows, wrists, groins and knees is distinctly thickened and ichthyotic, and presents a dirty, black, rough surface. The skin of almost all the trunk is deeply bronzed, but there is no pigmentation in the mouth. The patient complains of considerable discomfort from the papillomata on the eyelids. Otherwise there is no evidence of any visceral disease, such as has been described in other cases; there is no general glandular enlargement. The patient is aware of an increasing lassitude and occasional feelings of faintness, which suggests a resemblance to the early symptoms of Addison's disease. Pituitary, thyroid and suprarenal extracts have been tried, without benefit.

DISCUSSION.

Dr. DORE asked whether skiagrams had been taken of the patient's internal organs. He had such a case in which there were no symptoms of visceral disease, but skiagrams revealed malignant disease of the lung.

Dr. NIXON replied that skiagrams had not been taken, but that should be done.

Case of Congenital Hairy Mole.

By G. NORMAN MEACHEN, M.D.

THE patient was a girl, aged 10, who presented a large hairy mole involving the bathing drawers area, the hair upon which, it was said, had begun to grow at the age of 5. In addition, the rest of the body, face, and limbs was covered with numerous smaller pigmented moles. Over the large one at the back there were three swellings of a lipomatous character, which were said to have made their appearance only two months ago. Three months ago she was taken ill with an illness which was said to be "paralysis," and on account of some obvious wasting of the gluteal muscles upon the right side I asked Dr. T. R. Whipham, my colleague at the Prince of Wales's Hospital, to see her. He found a good deal of muscular wasting upon the right side, and the knee-jerk was feeble upon that side. Dr. J. Metcalfe was also kind enough to test her electrical reactions, which were as follows: Response to faradism below normal, galvanic reaction normal. The pubic hair was well developed, but the girl had never menstruated. The mother declared that the mole was due to the fact that an elephant thrust its trunk in her face one day at the "Zoo" when she was in the fourth month of her pregnancy.

Case of Congenital Mole of Peculiar Distribution.

By G. NORMAN MEACHEN, M.D.

THE patient was a boy, aged 4, the youngest of a family of nine, who presented a congenital mole upon the scalp and face of a somewhat unusual distribution. There was a large patch upon the right temporo-parietal region which almost exactly resembled a patch of tinea, the hair being partially denuded. So complete was the resemblance that a few hairs were taken and examined for spores, but with a negative result. Two other smaller patches were present upon the scalp, one in the right mid-parietal and the other in the mid-occipital region. There were also discrete patches of pale brown nævoid tissue, devoid of hair, upon the right side of the neck, upon the shoulder, and a linear one upon the nose. The mother was positive that the condition was due to the fact that she was frightened by a large crab in the fifth month of her pregnancy.

DISCUSSION.

Dr. F. PARKES WEBER said that the cases he had collected¹ were different from this; they were associated with vascular overgrowth of angiomatous nature, including cases of so-called "congenital varicose veins." The evidence of nerve lesion in one lower extremity in Dr. Meachen's present case made it just possible that the large hairy nævus and the central tumour (though it felt like a lipoma) over the lower part of the vertebral column might be connected with latent spina bifida; but if that were the correct explanation, one would have expected the hypertrichosis to be much more limited in distribution than it was.

The CHAIRMAN (Dr. Stowers) said that during the last eight months he had seen two cases of the same character, though much more marked than this instance. One was that of a young lady, aged 17, who was so disinclined for it to be examined that only her parents and one other person, besides Dr. Pollock Muir who brought the case to him, had seen it. The hair was limited to the buttocks and lower abdomen. The other was that of a youth, aged 16, who presented himself for examination previous to admission into a London bank as a junior clerk. The whole of his back was covered in a similar way, the hair being very abundant and pigmented. By means of a high collar he was just able to hide the upper limit. In both Dr. Meachen's cases there was

¹ F. P. Weber, "Angioma-formation in connexion with Hypertrophy of Limbs," *Brit. Journ. Derm.*, 1907, xix, p. 231.

a history of strong maternal impression. In his own two cases Dr. Stowers stated that maternal impressions were also reported. In the first (the girl) the mother when six and a half months pregnant was frightened by a cow, and in the second (the boy) the mother when five months pregnant was startled by a monkey jumping suddenly upon her lap.

Case of Alopecia following Severe Impetigo of the Scalp in a Girl, aged 6.

By J. M. H. MACLEOD, M.D.

ON the scalp there were a number of bald patches which were dotted over with small fibrous growths. According to the mother's statement the affection had begun two years before in the form of purulent sores on the scalp, which became crusted over with a thick scab. When this separated the bald areas were left, upon which the papillomatous growths subsequently appeared.

DISCUSSION.

Dr. ADAMSON thought the condition was post-kerionic alopecia; the distribution of the patches was characteristic of ringworm.

Dr. CORBETT remarked that cases of ringworm which had been treated with pure carbolic or croton oil presented a similar appearance after the subsequent inflammation had cleared up.

Dr. SEQUEIRA said he had not seen kerion leave this condition.

Dr. MACLEOD replied that in kerion the hair usually grew well, but there was no sign of growth in this case, though it was undoubtedly a possible cause. He considered that the lesions on the surface of the bald patch were rather in the nature of small fibrous growths than true papillomata.

Case of Grouped Comedones in a Girl, aged 2.

By J. M. H. MACLEOD, M.D.

THE eruption began when the child was aged 1, and was probably the result of camphorated oil and turpentine which had been rubbed on to the skin by the mother, as the child suffered from bronchitis. It was present chiefly on the upper part of the back, shoulders and chest, and

to a less extent on the forehead and cheeks. The lesions consisted of grouped comedones, acne pustules, white pitted scars, and minute fibrous thickenings dotted over with pits. A comedo was examined for acne bacilli with negative results.

Case of Dermatitis Herpetiformis, treated with Salvarsan.

By RUSSELL WILKINSON.

THE patient, a man, aged 42, was admitted to the Male Lock Hospital on January 2, 1914.

History: During November, 1912, when in a common lodging house in Coventry, the patient noticed what he calls a "blister" on his chest, which lasted a few days and then burst, giving rise to a group of similar lesions. Within ten days his body was covered with the eruption, and he was taken to the infirmary at Bromley, where he remained for the fourteen months previous to admission. He denies having contracted syphilis, and there is no evidence that he has done so.

On admission: The whole body was covered with a generalized herpetiform eruption, with a tendency, especially on the chest, to the formation of definite groups. Close examination of any of these groups showed several blebs the size of small peas. Some of these in each group had burst, leaving a scaly crust, and a later stage of these lesions showed erythematous macules, which gradually faded, leaving a pigmented area. All these stages could be found in any typical group. The patient complained of the most intense irritation, and the smell was very offensive. A few hæmorrhagic vesicles were found, but the serum from the majority was clear, and was found to contain staphylococci only. The patient's general condition was very poor; he had marked glandular enlargements in both groins, and also behind the angle of the jaw. The axillary glands were unaffected, and the liver and spleen normal. The Wassermann reaction was tested twice, and was strongly positive on each occasion.

Progress: The patient had alternate sulphur and lysol baths daily, and was treated internally with 5 minims of benzol in olive oil four times daily. This was continued for three weeks, and the first photograph shows the result after that time (fig. 1). The improvement in his general condition was marked, but with regard to the lesions was very slight, and confined to the first four days, when the offensive odour

began to disappear, and the crusts to be removed by the baths. On January 25 a blood count was taken, showing polynuclears, 64 per cent.; eosinophiles, 22 per cent.; lymphocytes, 12 per cent.; large mononuclears, 2 per cent. One of the large glands was also removed from the groin, and sections of this were kindly prepared and examined by Mr. McDonagh. This showed that the capsule was much thickened, from which fibrous tissue strands passed into the medulla. The lymphoid follicles were on the whole well maintained, a few were increased in size, and others broken up where there had been an extra



FIG. 1.

attempt at the formation of lymphocytes. In between the lymphoid follicles there was a large increase of lymphocytes, with a marked proliferation of plasma cells. There was no evidence of fragmentation of the protoplasm of the plasma cells, nor of division of their nuclei. There was an extraordinary increase of "mast" cells. From this appearance one would judge the enlargement to be caused by a chronic infection, probably septic, there being nothing suggestive of a pseudo-leukæmic condition. On January 27 an intravenous injection of 0.9 gm. neo-salvarsan was given, and on the following day the irritation had subsided somewhat, and no fresh vesicles had appeared. The macular

pigmentation began to fade more rapidly. These changes are shown in the second photograph, taken within twenty-four hours of the injection (fig. 2). On February 3 a second injection was administered, and on the following day a further improvement was noticed, especially on the chest and upper abdomen, where nothing remained but the old pigmented areas, now gradually fading. On February 10 an injection of salvarsan, 0.6 grm., was given, and at present the outbreak of vesicles is limited to about three a day. The irritation is subsiding, but is still severe.



FIG. 2.

The points which it would be interesting to clear up are whether this is a case of dermatitis herpetiformis with a positive Wassermann reaction, or whether the positive Wassermann reaction has to do with an old syphilitic affection, upon which the dermatitis herpetiformis is either dependent or independent. With such a high blood count of eosinophiles, and such a diminution in the number of lymphocytes, a pseudo-leukæmic condition seems probable. However, pseudo-leukæmia may be preceded by dermatitis herpetiformis, and there is no doubt that syphilis plays a part in its causal relationship.

In conclusion, I wish to state my great indebtedness to Mr. McDonagh for the help he has given me, and to thank him and Mr. Lane for permission to show the case.

Dr. H. C. SEMON said he had a case at the Great Northern Hospital which, clinically, could not be distinguished from the present one, and he mentioned it in order to raise a point in regard to it. The patient had been under treatment for psoriasis for twelve years, and one of the physicians who treated her was the late Dr. Radcliffe Crocker, whose prescriptions he had seen. From them it seemed clear that the case had been psoriasis. During the last four months she had been under treatment by a local practitioner (no arsenic given), who assured him it was psoriasis. When she came to hospital she was developing lesions of what he regarded as of a pemphigoid type, and later she developed typical crescentic erythematous patches, and on the surface of these the vesicles designated dermatitis herpetiformis of Duhring. He had not given her salvarsan, but she had reached a high dosage of arsenic—namely, 12 minims three times a day, and was rapidly improving under it. Dr. Gray had seen the case and agreed that it was dermatitis herpetiformis. He asked whether psoriasis had ever directly preceded dermatitis herpetiformis, or whether the latter might be due to some energetic self-treatment of psoriasis. She had used cuticura soap and ointment, and had consecutively developed exfoliation, especially of the palms and soles. There was no specific history. The blood showed 27 per cent. eosinophiles, exceeding even the high percentage of the present case. There was no evidence of intestinal sepsis. She had had a raised temperature, but it had now subsided.

Case of Lupus Erythematosus affecting the Buccal Mucous Membrane.

By W. KNOWSLEY SIBLEY, M.D.

THE patient is a married woman, aged 42, who has suffered from lupus erythematosus of the scalp, face and mouth for the last twelve years. The lesions first appeared on the scalp, then on the left cheek, over the bridge of the nose, and about the same period on the buccal mucous membrane. At the present time some half a dozen roundish isolated patches, varying from 1 to 2 cm. in diameter, are situated in the scalp region, showing superficial scarring with complete alopecia; small lesions are also present in both ears, and two on the cheek in front of the left ear. There is not any affection of the fingers. The oral mucous membrane is extensively involved, nearly the whole of that covering both sides of the cheeks shows superficial scarring, and in places some more recent ulceration, together with a good deal of lividity with a distinctly violaceous tinge. An active lesion is present on the mucous membrane of the upper lip, which is very painful, the condition

inside the mouth not having given rise to much discomfort. On the upper lip there is slight infiltration, some superficial ulceration, and in places well-marked small sieve-like puncta, showing infiltration and degenerative changes of the sebaceous glands and their ducts. The lower lip is unaffected, so also are the hard and soft palate and tongue. At one period the mucous membrane just inside the alæ nasi was also affected, the condition having here extended from the skin, which shows some atrophic scarring in this region.

Lesions of the mucous membranes in lupus erythematosus were considered to be very rare, but recent observations point to a more common occurrence. The fact that lesions inside the mouth in this disease do not as a rule give rise to much discomfort is probably the explanation why they are frequently overlooked. The case under discussion, although she has had the condition for many years, had never mentioned it, until a recent painful lesion on the mucous membrane of the lip drew attention to this region. She states that the condition, both of the skin and of the inside of the mouth, is always worse in cold weather, and that at times the irritation of the lesions on the scalp and face is very considerable.

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Dr. SEQUEIRA said that one of his clinical assistants, Dr. T. Smith, in 1906, examined fifty-six consecutive cases of lupus erythematosus, and found lesions of the mucous membrane in 28 per cent.¹

Case of Lichen Planus Hypertrophicus.

By DUDLEY CORBETT, M.D.

THE patient was a girl, aged 15, who came under observation a fortnight ago with this condition which had started six weeks previously. The patches had a linear distribution on the anterior aspect of the right arm, extending to and involving part of the thenar eminence. The lower patches were raised above the level of the surrounding skin and were covered with a dense layer of horny epithelium. The patch on the upper arm was of more recent origin, and it could be seen that the process had started in the hair-follicles. Pigmentation was evident in the older lesions, being of a bluish-red colour. There were no other lesions on the body. She had had two one-third pastille doses of X-rays at an interval of a fortnight, which had altered the appearance of the lesions considerably, all the hyperkeratosis had disappeared, and the patches were now level with the surrounding skin. No other treatment had been used, and no arsenic had been given. The condition at first sight resembled a unilateral nævus, but closer inspection, and the fact that improvement under X-rays had been so rapid, showed that it was a hypertrophic lichen planus with a linear arrangement. The age of the patient and the unilateral distribution marked this as an unusual case.

Case of Multiple Idiopathic Pigment Sarcoma treated by X-rays.

By J. H. SEQUEIRA, M.D.

DR. SEQUEIRA again brought before the Section a male patient suffering from Kaposi's so-called multiple idiopathic pigment sarcoma, to show the remarkable improvement under X-ray treatment. The patient was shown at the International Medical Congress in August, and at the meeting of the Section in October. The case, which was

¹ *Brit. Journ. Derm.*, 1906, xviii, p. 59.

reported in full in the *British Journal of Dermatology*, xxv, p. 351, was an early one, characterized chiefly by chronic purplish infiltration of the feet and ankles, and to a less degree of the wrists and backs of the hands. There were a few small nodules upon the generally infiltrated areas. The X-ray treatment was begun in August, and was repeated at somewhat irregular intervals. In all, each part affected received about 50 H units, the applications being made through a screen of aluminium 0.2 mm. thick. There had been no reaction. The condition of the infected areas was now completely changed; the skin was of normal consistence, and the purplish tint had gone. Beyond some brownish staining of the parts there was no evidence of the disease. The case will be carefully watched and further reports made.

Case of Polycythæmia Rubra.

By H. MACCORMAC, M.B.

G. H., AGED 64; nothing of importance in family history. His health has generally been excellent. No previous illnesses. The present condition began six years ago, when his friends told him his face looked "flushed and blue." About this time he had his first attack of articular gout; since then he has had several other attacks. He has also had sciatica. The rubicund condition of his face and extremities has become more marked. The small blood-vessels can be very distinctly seen on the face, and there is a general reddish-blue colour, which is also well marked on the mucous membranes. Apart from a feeling of lassitude his general condition is fairly good. The spleen is very considerably enlarged. Blood count: Red blood corpuscles, 8,500,000; white blood corpuscles, 9,000; hæmoglobin, 130 per cent.

Case of Bromide Eruption.

By W. T. FREEMAN, M.D.

G. G., AGED 14 months, male. Admitted as out-patient under the care of Dr. Murrell at the Royal Berkshire Hospital, on December 23,



Case of bromide eruption.

1913. Five weeks previously he had been given a mixture containing 2 gr. potassium bromide to the dose. In all he had taken about 80 gr. About three days after starting the medicine a papular rash appeared scattered singly over the face, body and limbs. The papules were hard and tense and a few of them became umbilicated. They rapidly increased in size.

When brought to the hospital the large number of the papules presented the appearance already described. Many, however, had

developed into tuberoso growths, and the largest growth upon the face measured $2\frac{3}{4}$ in. by $1\frac{1}{2}$ in. and was raised $\frac{5}{8}$ in. from the surface of the skin. Many of the others upon the body and limbs were of nearly the same measurement. They gave a feeling of fluctuation, but contained no fluid.

The child was not ill, was cheerful, and there was no rise of temperature. There was a disagreeable odour from the body. The photographs show the condition at its height. When exhibited the papules had disappeared, the larger growths had subsided considerably, and the smaller growths were represented by pigmentary stains.

Case of Rodent Ulcer.

By GEORGE PERNET, M.D.

THE patient was a woman, aged 56, with a rodent ulcer of four years' duration, which had been allowed to spread unchecked from the begin-



Case of rodent ulcer.

ning. No advice of any kind had been sought until the patient attended the West London Hospital two weeks previously. The rodent ulcer extended from the inner canthus of the left eye, and had spread over the nose, destroying the left ala nasi. The general appearances were well brought out in the photograph.

Dermatological Section.

February 19, 1914.

Dr. JAMES GALLOWAY, Vice-President of the Section, in the Chair.

Discussion on Pityriasis Rosea.

Opened by E. G. GRAHAM LITTLE, M.D.

I SHOULD like to begin my remarks with a grateful acknowledgment to Dr. J. J. Pringle, for his choice of myself as the first introducer of a debate during his Presidency of the Section. It is a pleasant reflection that I learnt much of what I know of dermatology during my happy apprenticeship with him at the Middlesex Hospital, and it is a very sincere regret to me that he is unable through illness to preside, as he intended to do, to-night.

I have made a very careful analysis of my personal experiences of this disease at St. Mary's Hospital, at the East London Hospital for Children, and in private practice during the past eleven years; since, in fact, I have been in charge of the Skin Departments at those Hospitals. I find that of a total number of 21,075 cases of general skin disease seen in a mixed clinic, 146 were cases of pityriasis rosea. Of 5,864 cases of skin disease at the Children's Hospital, of which I have notes, 28 were cases of pityriasis rosea, so that I have record of 174 personal cases. This is the largest number of cases of this disease which I can find recorded by a single observer, and although it is in itself too small a number to serve as the foundation of a statistical inquiry of any value, the personal impressions derived from their study, reinforced by the personal impressions which the subsequent discussion may call forth, of my colleagues in charge of other dermatological departments, may not be without interest or some practical utility.

Pityriasis rosea has probably been chosen for the discussion this

evening because the views held as to its ætiology have long been in a fluid condition, and recently an observation has been put on record which again revives the possibility that some of the older writers were correct in regarding pityriasis rosea as a microbic disease, due to the presence of pathogenic organisms. The identification of the disease is recent enough for the history to be interesting. It is curious that Gibert, who first gave an account of the characteristic eruption, and who has the undivided credit of its discovery, really missed very much of its significance, and his description is extremely short, so that I propose to read the text to you. Under the heading "Pityriasis" he writes :—

"One can thus establish some new distinctions intermediary between pityriasis simplex and pityriasis rubra, according to the form, extent, course, and degree of coloration of the eruption. The two most accentuated types which we have observed in this category of eruptions are: (1) The class which we have just indicated, the aspect of which approximates somewhat to lichen, sometimes to psoriasis. (2) Another variety which one might describe by the name of pityriasis rosea, and which offers the following characteristics: There are small branny patches, very slightly coloured, irregular, of a size which seldom exceeds that of the nail; numerous and closely grouped, but always separated by some interval of healthy skin; itchy, spreading on the upper parts of the body, by preference on the neck and upper part of the chest and of the arm. They may progressively develop from above downwards to the level of the thighs, so that the whole duration of the eruption, which, as it ascends lower, fades little by little in the parts which it occupied previously, is usually six weeks to two months. This eruption, which is commoner in women than in men, appears fairly frequently during the hot season of the year. It is chiefly observed in young people, and in those persons whose skin is white and fine and delicate."

Gibert describes five principal varieties of pityriasis classed as follows: (1) Pityriasis simple; (2) pityriasis rosea; (3) pityriasis rubra; (4) pityriasis versicolor; (5) pityriasis nigra. He makes, a few pages later in the same work, the curious statement that pityriasis rosea is "subject to recurrences." He remarks upon the fungus, then newly discovered, in pityriasis versicolor, and says that repeated experiments failed to show any fungus in pityriasis rosea. This appeared only in the third edition of his treatise in 1860. It is a matter of some doubt whether the disease had been previously indicated by other

names, for it has been suggested, for example, that Willan's (1798) "Roseola Annulata," Rayer's (1828) "Erythema Annulatum," and Wilson's (1857) "Lichen Annulatus Serpiginosus," were probably cases of pityriasis rosea. Gibert, however, undoubtedly first gave its present name, and his description remains a faithful account of at least one form of this disease. It will be seen from the text which I have read to you that he did not recognize the annular variety of pityriasis rosea. He, in fact, as I have shown, considered his pityriasis rosea as an intermediate variety between pityriasis simplex and pityriasis rubra.

Attention was directed to the much commoner variety, that with annular lesions, by Bazin in 1862. Another remarkable feature of pityriasis rosea, the appearance of the so-called "primitive patch," was made known by another great French dermatologist, Brocq, in 1887; Thibierge first drew attention in 1889 to the fact that pityriasis rosea does not occur twice in the same patient. Darier in the same year described its histology. Thus, the accepted description of pityriasis rosea is essentially due to the great French school. Singularly enough, it is on the other hand owing to the Viennese school that the most curious confusion of this disease with ringworm arose, and has persisted even to the present day with some members of that school. Ferdinand Hebra, in 1876, described what we now consider to have been pityriasis rosea under the term, "Herpes Tonsurans Maculosus." His views were supported by Kaposi, who continued Hebra's work. On p. 214, vol. v, of the Sydenham Society's translations there is a woodcut illustration of the fungus and spores, which, according to these authors, are to be found in the scales of pityriasis rosea. The picture supports the description of the text, that the disease is a form of ringworm. Behrend, in 1881 made a notable protest against this view, but some later writers have supported Hebra; Havas, for example, says that he "always" finds fungus in the scales of pityriasis rosea. In an elaborate paper chiefly devoted to histology, Loewenbach claims to differentiate, on histological grounds, pityriasis rosea from herpes tonsurans maculosus. It is rather difficult to apprehend on what observations Hebra founded his description. In one of my own cases there was a most curious and, I believe, unique coincidence of pityriasis rosea with tinea circinata; the fungus being readily demonstrated in one or two lesions of true tinea, and entirely absent from the great majority of the lesions, which were those of pityriasis rosea.¹ Whether Hebra really confused

¹ *Brit. Journ. Derm.*, xviii, p. 184.

such cases is impossible to say, but it may probably be asserted with confidence that the view that pityriasis rosea is due to ringworm organisms is erroneous, and essentially obsolete at present.

The description of a parasite other than ringworm as a cause of the disease originates with a communication by Vidal in 1882, when this author published an account of several cases of an eruption which he called "Pityriasis circiné et marginé." He himself regarded his disease as differentiated from pityriasis rosea, and he gives elaborate distinctions between them; but, notwithstanding, it is difficult to avoid the conclusion, to which his colleague Besnier is driven, that Vidal's disease is pityriasis rosea in somewhat anomalous varieties. But the circumstance which lends particular interest to Vidal's communication is that he claims to have found in all his cases a peculiar kind of spore, distinguished by its smallness and inequality of size, from which circumstance he proposed the name of *Microsporon dispar*; by its position surrounding the epithelial cells and the orifices of hair-follicles; by its absence of mycelium, although sparse chains of four or five spores could be seen. Ferrari, in 1885, confirmed Vidal's statement, but, with this exception, Vidal found no support for his parasite until the quite recent communication by Du Bois in 1912. This is so interesting a paper that I propose to consider it more in detail later.

The parasitic theories having met with little support in the past thirty years, other views as to ætiology prevailed; the lapse of an appreciable interval between the appearance of Brocq's primitive patch and the general invasion of the disease offered some resemblance to the incubation period of a specific fever, and Brocq, in fact, drew an analogy between the primitive patch and the chancre in syphilis. The regular course of the eruption, which behaved rather like an exanthem; the involution of the disease, practically unaffected by treatment; and the apparent immunity conferred by an attack, all suggested that pityriasis rosea is of the nature of a specific fever. Much probability was added to this view by the not infrequent general enlargement of the glands and constitutional symptoms observed in this disease. The chief difficulty in the acceptance of this causation is to be found in the extreme rarity of any history of infection. Instances in which patients may seem to have contracted the disease from contact, although they exist, are extremely few. The best established is that of Zeissler's personal experience. He developed pityriasis rosea, diagnosed as such by Hyde; two weeks later his wife showed the same eruption. Crocker saw it on two occasions in members of one family. Fordyce noted the disease

"about the same time" in husband and wife; and in two sisters occupying the same bed; and ringworm was specially excluded in both cases. G. H. Fox records it in a mother and child. Horand is usually quoted as describing a possible instance of infection in two brothers, but reference to his original paper establishes the fact that the one brother had the disease from March 20 to June 27, 1874, and the second brother from September 3 to October 28 of the same year, there being thus a clear interval of over two months between the cases. In my personal series of 174 cases I have seen it in a woman, aged 34, whose sister had it a week previously. This is the only instance in which I have met with an approximate affirmative in my repeated investigations as to infectivity.

The very irregular incubation period—i.e., the interval between the initial lesion and general invasion—which Brocq in his original paper gave as varying from four to fifteen days, is also a difficult objection which the infective theory has to meet. The complete absence of any apparent incubation period in more than half the cases constitutes a still more formidable objection. It is not surprising, therefore, that other causes have from time to time been invoked as explaining the disease. Analogies have been found between pityriasis rosea and the toxic erythemata; Besnier, while admitting the great probability of a "microphytic cause," is impressed with the frequent association with gastric dilatation, as noted by Jacquet, Feulard, and others; Sherwell saw it two or three times in connexion with pregnancy; in one instance at two successive pregnancies in the same patient. Fiocco noted the occurrence of indicanuria and peptonuria, usually regarded as indications of intestinal disturbance, in a series of cases of pityriasis rosea. Phillips observed two attacks of jaundice in a prolonged case of pityriasis rosea.

External irritants—e.g., the wearing of damp, ill-ventilated clothing, damp rooms, and the existence of a humid atmosphere—have been from time to time offered as explaining the genesis of the disease. Lassar regarded the wearing of new undergarments as a probable cause. A recent case under my own care gave a very convincing narrative of this possibility, and the distribution in the vest area, which has been described by Adamson as the usual site of the disease, aids the illusion—if it be an illusion—that the condition of the vest may have something to do with the causation. That there is a seasonal incidence of the disease seems probable, but there is no agreement as to the season. Gibert, we have seen, regarded it as commoner

in the hot season. Moingeard, out of 56 cases collected by him in 1889, noted its occurrence thirty-five times—i.e., 63 per cent.—in the spring (April, May, June). Szaboky, in a series of 119 cases in Professor Nékám's clinic, thought there was no evidence of seasonal variation; but, examining his cases, there is a certain preponderance in the cold months; thus, he cites 28 per cent. as occurring in "autumn," 31 per cent. in "winter," and 30 per cent. in the "transition" between hot and cold weather. In my own series of cases, in 174 of which I have notes, there was a curious rise in frequency in the months of July, October and December; on the other hand, the spring (April, May, June) offered the lowest frequency in the series. I append a chart, showing the curve for

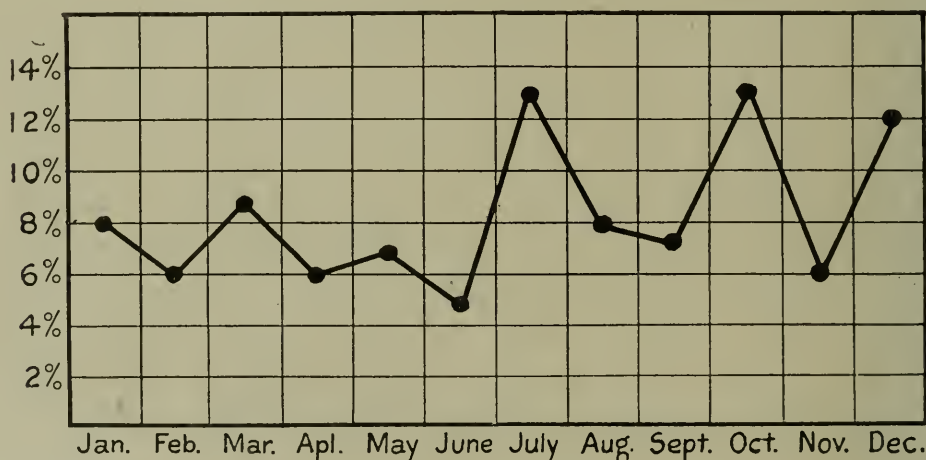


Chart showing the monthly distribution of pityriasis rosea, as observed in the Skin Department of St. Mary's Hospital in the period 1903-14.

each month. My statistics confirm Szaboky's experience of a certain preponderance in the latter half of the year.

The views of causation hitherto examined have regarded pityriasis rosea as a disease *sui generis*; we have noted that Gibert described it as merely a stage between pityriasis simplex and pityriasis rubra, and a similar view, which would consider pityriasis rosea as a "fait de passage," or intermediary link between other scaly inflammatory diseases, such as psoriasis, psoriasiform parakeratosis, pityriasis rubra, is advocated by Brocq, by Darier, and others. In this connexion, and as rounding off the consideration of ætiology, I may refer more in detail to the paper I have already quoted by Du Bois. This writer investigated three cases, which were clinically regarded as respectively: (1) Pityriasis rosea, (2) pityriasis circiné et marginé of Vidal, and (3) psoriasiform

parakeratosis of Brocq. He advises very careful handling of the scales, which are to be lifted off by inserting the blade of a very fine scalpel, the scale being placed on the slide, with its external surface downwards on the glass, washed with ether-petrol, mounted in Canada balsam, and so examined without any crushing or teasing. In the scales of all three cases Du Bois claims to have found spores of a similar type. No mycelium was found, nor could the organisms be stained or be grown on any culture medium. They were about $5\ \mu$ in size, and situated about the follicular and glandular orifices. Du Bois regards them as cryptogamic, and proposes to call them, in honour of Vidal, whose ancient and sometimes derided observation he thus confirmed anew, by that master's suggested title, "*Microsporon dispar*." Du Bois claims to explain the uniform failure which has met so many other observers in their attempts to demonstrate the parasite in the scales by the suggestion that these observers have been too violent in their methods of removing the scale, which must, in fact, be very gently performed. Du Bois's parasite has been demonstrated in pityriasis rosea by other observers, notably by Covisa and by Nékám.

By the kindness of the latter teacher, appearances very like those figured by Du Bois were demonstrated to me in his clinic in Budapest, and he has sent me a slide showing the same features, which I have seen myself this afternoon, when I received the slide, but which I am unable to demonstrate this evening, as I have brought a section in which the demonstration is much less easy than in a second slide which I have omitted to bring, but which I hope to show the Section on a future occasion. I have made repeated attempts myself, following the technique prescribed by Du Bois, but have failed to find the bodies which I was shown in Professor Nékám's clinic, and which I have seen in the section he sent me. Du Bois's observation, if it can be regarded as established, produces a certain feeling of insecurity in the minds of those who have hitherto supposed that pityriasis rosea was a specific disease. If it be true that the same organism is responsible for the causation of pityriasis rosea, and a clinical entity in many respects so dissimilar as Brocq's psoriasiform parakeratosis, we shall have to revise our ideas upon the relations subsisting between these diseases; and it may come to pass that Brocq's views as to the essential similarity of a very large number of diseases usually regarded as completely dissimilar may really be shown to be not so fantastic as they appear. The weird graphic formulæ which Brocq draws up, indicating intermediate stages between pityriasis rosea, psoriasis, parapsoriasis, some forms of lichen,

seborrhœids, and even mycosis fungoides, are familiar to you all, and have hitherto met with little acceptance.

Age and Sex-incidence.—Thibierge, in his excellent description of the disease in the "Pratique Dermatologique," speaks thus dogmatically as to the facts under these headings: "It is well known that the disease occurs chiefly among young subjects between 15 and 35, that it is rare after 35 or 45, and still more rare before the age of 15; that it is more frequent in the female than the male sex in the proportion of two to one. These are statements which are of the nature of platitudes" (quelque peu banales). Taking the age-incidence first, I would remark that an analysis of my 146 personal cases—i.e., exclusive of the material

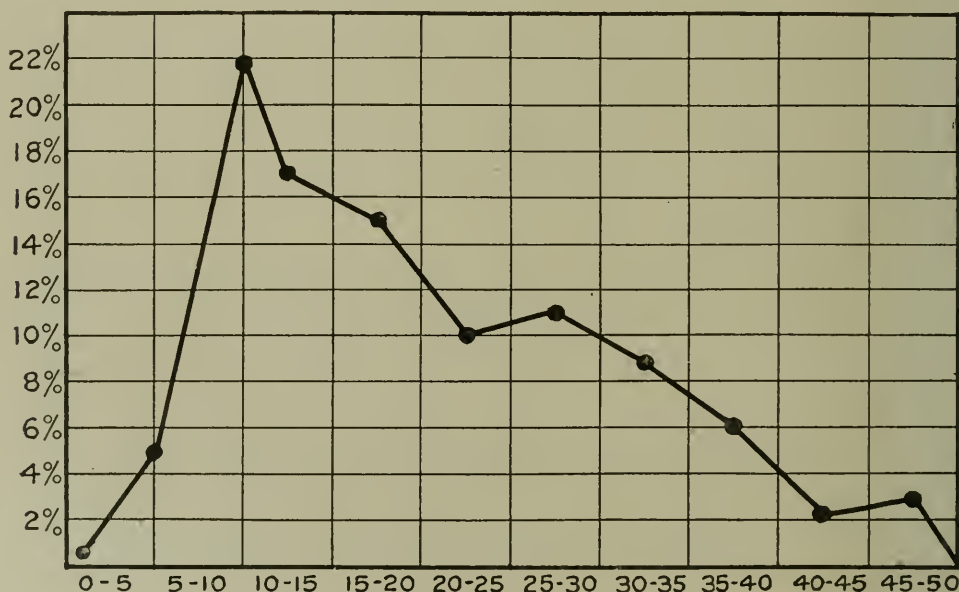


Chart showing the age-incidence of pityriasis rosea, in quinquennia up to fifty years, as observed in the Skin Department of St. Mary's Hospital in the period 1903-14.

at the Children's Hospital—does not agree with Thibierge's experience. In the percentage chart which I have drawn up, it will be seen that the curve rises highest in the quinquennium 5 to 10 (22 per cent.); and that 44 per cent. of my cases in a mixed clinic of adults and children occurred under the age of 15, which Thibierge regarded as commonly the youthful limit of the disease. My youngest case was aged $1\frac{1}{2}$, and my oldest 64. Crocker says, "One-third of the cases are in children"; he had a case at 7 months, and at 70 years, and these, as far as my reading goes, are respectively the youngest and oldest ages recorded. In Szaboky's series, which comes next in number to my own, 87 out of 119 cases occurred between 15 and 40. In Moingeard's series of 56

cases, 41 occurred between 15 and 35; Thibierge's article is probably largely based as regards its statistical statements on this analysis.

The sex-incidence is equally a matter of controversial statement. Thibierge follows Moingeard in his figures of two females to one male. Adamson, comparing 45 cases, gives the same ratio. Szaboky makes the exactly opposite statement; in his 119 cases 67·2 per cent. occurred in men, which is very nearly two males to one female; he accordingly sums up his opinion that "the disease occurs mostly in adult men." Tandler's experience confirms Szaboky; he found in a series of 14 cases 10 men to 4 women. Of my own 174 cases, 89 are females and 85 males, so that my experience agrees with Crocker's, who could find no sexual preponderance.

An inspection of the statistics of various writers leaves the impression that the disease is becoming more frequent in England, and that it is enormously more prevalent in some countries than in others. Crocker's statistics, which were published in 1893, and based on an analysis of 10,000 hospital patients, gave 4 per 1,000; Adamson, in 4,000 hospital patients had 45 cases of pityriasis rosea—i.e., 10·1 per 1,000. My statistics for hospital patients (1903-14) gave 6·7 per 1,000 in a mixed clinic, 4·7 per 1,000 in the Children's Hospital. Brocq also notes the increase in frequency of this disease in France. In Nékám's clinic in Budapest an analysis of 100,000 general skin cases gave, I am told, a prevalence of about 40 per 1,000 of pityriasis rosea, which contrasts strangely with some statistics of the American Dermatological Association for the years 1878-87, quoted by Stelwagon: In a collection of 123,746 cases of general skin disease, pityriasis rosea (entered as pityriasis maculata et circinata) occurred only 70 times—i.e., 0·57 per 1,000.

I suppose most of my colleagues will agree with me that the diagnosis of pityriasis rosea is rarely made by the general practitioner, and it is certainly desirable that the prevalence of this disease should become more widely recognized. Its clinical features are so conspicuous that mistakes are the less excusable. I do not propose before this audience to give a detailed description of the clinical features, but it will perhaps be not without advantage if we compare individual experiences on certain aspects of the disease.

The Primitive Patch.—Cases as convincing as Brocq's instance, described by him in 1887, are certainly rare in my experience. In that instance the patient was seen, by Brocq himself, whilst having a single patch which doubled in size in a few hours; it was treated for a mycotic affection, although the possibility of pityriasis rosea was

noted at the time; this patient developed the general eruption from eight to ten days later, when he was again seen by Brocq. I have sometimes succeeded in satisfying myself, apart from the history given by the patient, that one of the patches was larger and therefore probably considerably older than the others, but my own impression is that one gets this history and these facts comparatively infrequently. Douglas Montgomery, analysing thirty-eight personal cases, makes the somewhat contradictory statement that "In all probability most cases begin with the primitive patch described by Brocq," but that "it is the exception to find the primitive patch or any history of it." Szaboky in the statistics quoted found it in 50 per cent. of the cases. Weiss in a smaller series of 14 cases noted it only twice. In my own series of 174 cases it is recorded only nineteen times. When I have met with it the intervals between the appearance of the patch and the general invasion have been very irregular, ranging from two to fourteen days, but Moingeard had a case with six weeks' incubation period. The size of the primitive patch may be very large; in a case reported by Allen it occupied half the chest wall; it is frequently as large as a child's hand (Jadassohn). The primitive patch is said by Brocq to occur most usually about the waist-line, on the front of the body, but he himself discusses the probability that the initial lesion frequently comes out upon the back and so escapes the observation of the patient. The position of the primitive patch was oddly one-sided in the most complete statistics on this subject, those of Szaboky, who found it, as I have said, in 50 per cent. of his cases, and in these in 77 per cent. of the number it occurred under the left clavicle, in 11 per cent. under the right clavicle, in 6 per cent. on the thigh, and in 6 per cent. over the sacrum. This writer also describes prodromata, such as sore throat, headache, feelings of lassitude, shivering and pyrexia of mild type, in 50 per cent. of his cases. I have the personal impression that there is perceptible general enlargement of glands in a majority of the cases.

Character of the Lesion.—Two types of lesion, the macular and the circinate, may be present, either co-existing or the eruption may be confined to one or other types. We have noted that Gibert wrote his description without apparently having seen the more prevalent variety in which the lesions are annular; one of the most characteristic features present in even early stages of the disease is the wrinkled surface of the scale covering the papules. The scale is very loosely attached to the skin and it may be readily lifted off with a fine scalpel. Brocq describes some special features as being present when the scale is

removed by a special technique which he has named "grattage méthodique." In its evolution the initial vivid pink colour rapidly and progressively fades, leaving as a rule a light buff tint, but sometimes, as in a case shown by myself at this Section,¹ the tint may be quite dark, almost a walnut brown. I have met with only one other such case of deep brown pigmentation.

Persistence of the Lesion.—We have seen that one of the most important characteristics mentioned by Gibert was the spontaneous disappearance of the eruption within a period of two months. Most writers accept this limitation as the rule, but it may be exceeded in exceptional cases. Vidal regarded the duration of his eruption, which was about six months, as negating the possibility of that eruption being pityriasis rosea. This would not be regarded as a fatal objection now; several cases have in fact been recorded with a longer persistence than this. Hallopeau had seen a case which persisted for four years; Fournier is quoted as having had a similar duration, but I have not traced his original statement; Tenneson records a case lasting six months; Phillips saw a persistence of nine months with a subsequent recurrence. Bronson records a case "lasting several months." Crocker had a case lasting "longer than six months," and "several of three or four months." A consideration of my own statistics shows that in three instances the eruption disappeared within two weeks of its commencement; in several instances within three weeks; a very usual duration was five to six weeks; in one instance active eruption was present for five to six months, and in another for three months; in both of the latter the type of lesion was large and recalled Vidal's cases in their clinical aspect as well as in their unusual persistence. Douglas Montgomery, in a prolonged observation of seven cases, had the following experiences: In one case a persistence of one week, one case two weeks, one case three weeks, one case four weeks, one case five weeks, one case six weeks, and one case three months.

Recurrence of the Disease.—Thibierge's original observation of the extreme rarity of this feature is confirmed by general experience, but a few isolated instances are recorded. The most striking is that of Allen, who claims to have seen it recur seven times in the same patient, a man of alcoholic habits, in whom the recurrency was associated with his relinquishment of alcohol as the result of New Year resolutions of sobriety. Sherwell saw it twice in the same patient in successive

¹ *Brit. Journ. Derm.*, xxv, p. 66.

pregnancies. Szaboky mentions a case in which the eruption persisted for six weeks, got completely well, and a few days later suffered a fresh eruption which lasted for five weeks. Phillips had a case which showed patches of pityriasis rosea nine months after a previous attack. Fiocco and Lefevre are quoted as having had instances of recurrences, but I have been unable to trace their original statements. I have had no personal experience of recurrence.

Distribution of the General Rash.—The large majority of cases show the greater part of the eruption on the trunk, and it is an old and true observation that the rash generally begins about the neck and spreads downwards to involve the trunk. More uncommonly the extremities are affected, but seldom beyond the level of the hands on the upper extremities, and the middle of the thigh on the lower extremities. Cases of anomalous distribution are not infrequent. The face is, on the whole, seldom affected, but I have seen the rash begin upon the face, and Photinos reports a case in which the eruption was throughout restricted to the face and neck. I have seen a distribution confined to the thighs, and also a strictly unilateral eruption on the right hip, right buttock and right thigh. Szaboky reports a similar instance of unilateral distribution, on the left side of the body. The same author saw the eruption once on the eyelids; he says that it never occurs upon the hands or feet, but Moingeard reported it on the backs of the feet; in a case reported by Stowers it was noted on the face, hands and feet and whole surface; Colcott Fox saw it on the dorsum of the hands; and Bunch showed a case with the vague description that the rash was "all over the body." Colcott Fox reported another case of probable pityriasis rosea on the fingers and toes and palms and soles, with vesication. Duhring saw the genitals affected in a case of general eruption. In a recent case of my own, in a very acute eruption, the whole surface was involved except the hands and feet. I have seen the eruption only once on the penis, and believe this to be rare; it occurred in a man, aged 33, who had deeply pigmented patches on the penis and elsewhere, synchronous with the more usual pink patches.

Anomalous Varieties of the Disease.—Vidal's cases of pityriasis circiné et marginé, accepted by Besnier and most subsequent authorities as examples of pityriasis rosea, constitute a rare but well-defined variation, chiefly characterized by the largeness of the patches and the duration of the disease. Darier describes a very rare type with enormous plaques which he calls pityriasis rosea gigantea. I have

never seen this variety, but I am obliged to Professor Nékám for the accompanying excellent photograph of such a case. Vörner and Hallopeau described a type in which the lesions were much raised and almost urticarial, for which the name pityriasis rosea urticata is proposed. I believe I have had two such cases, one in a young woman in whom the nearly universal eruption, quoted above, occurred, in whom the itching was intolerable for a month and more, and left much desquamation and staining; another very extensive eruption in



Pityriasis rosea gigantea (Darier). (Photograph lent by Professor Nékám.)

a young man, with many follicular maculo-papules, which were very itchy. This case recalled the anomalous case quoted by Fox, in which the papules were also follicular. Besnier long ago noted the site of the early pityriasis rosea papule as being follicular.

Histological Characters.—I have nothing to add to the excellent descriptions of the histology of the disease published by Darier, Hollmann, Sabouraud, and others. I have not had many opportunities of getting biopsies in a disease in which it hardly seemed justifiable

to excise portions of the skin, as the disease itself was of so innocent a type.

Differential Diagnosis.—The chief difficulty met with by the general medical practitioner seems to lie in distinguishing from pityriasis rosea a syphilide closely resembling it. It is not, I think, so often mistaken for the roseolar syphilide as for the early and rather rare discoid papulo-squamous syphilide, a fact noted by Douglas Montgomery also. The criterion much insisted upon, that the syphilitic lesion is not scaly, does not therefore quite meet the case. I have been much puzzled within the last two weeks by a case of an eruption in a boy, aged 7, in whom at his first appearance I made a note that the eruption was a typical pityriasis rosea. A week later a change had taken place. Some few deeper-seated and darker-coloured papular lesions had made their appearance, and an examination proved that all the glands were enlarged. The boy gave no history and evinced no symptoms whatever of a primary sore, but his blood showed a definitely positive Wassermann reaction, and there was no doubt that the eruption was syphilitic. I can recall a similar case, in 1906, in which the diagnosis remained entirely doubtful, even although the patient was seen by a large number of dermatologists. The earlier diagnosis of pityriasis rosea in this case also was replaced by that of syphilis, when a more detailed examination revealed a lesion on the forefinger, which the patient, who was himself an experienced medical man, had regarded as a common wart, but which was probably in reality a primary chancre. Dr. Pringle showed a case at the old Dermatological Society of London, in June, 1900, of a young woman in whom the first diagnosis made by the Society was that of syphilis, but this was revised in favour of pityriasis rosea a month later.¹ Wild reports four cases which had been mistaken for syphilis and treated as such. In some of the cases confusion was introduced by the fact that the patient actually had had syphilis. The distribution of pityriasis rosea is different in some particulars from that of syphilis—it rarely occurs on the face and scalp, and the palms and soles, which are the common positions for syphilis. The grouping of the lesions in the direction of the ribs is striking in pityriasis rosea, and does not occur in syphilis. In the older patches of pityriasis rosea, a characteristic buff-coloured crinkling of the skin “like cigarette paper” is often observed. There is less infiltration in the case of pityriasis rosea than in syphilis. The initial patch of pityriasis rosea, upon which

¹ *Brit. Journ. Derm.*, xii, pp. 246 and 296.

so much stress is usually laid in its description, is more often absent than present, so that the help it affords in diagnosis is not great. At the present time of course a state of hesitation would be solved by the result of a Wassermann test, so that the clinical differentiation becomes less important.

From ringworm pityriasis rosea can usually be distinguished at sight by the fact that the eruption of the latter is much more extensive than the eruption in ringworm, which can be diagnosed microscopically by finding fungus. The presence of mycelial threads characteristic of ringworm would probably be regarded by all modern writers as conclusively negative of pityriasis rosea. I have mentioned a case of my own, shown at the old Dermatological Society of Great Britain, in which lesions of undoubted ringworm co-existed with lesions of undoubted pityriasis rosea, fungus being found in the former and not in the latter. I have had two cases in children in whom tinea tonsurans was present simultaneously with pityriasis rosea; the absence of fungus in the lesions on the body and the cyclic evolution negatived the possibility of a diagnosis of tinea circinata.

From seborrhœic eczema the best criterion probably is the finding of the bottle bacillus in large quantities in the scales of seborrhœic eczema, and its absence in the scales of pityriasis rosea. The distribution of seborrhœic eczema is usually different: the site of election for the latter is the mid-line of the body; the site of election for pityriasis rosea is rather on the flanks. The scales in seborrhœic eczema are more greasy in feel and the lesion is usually yellowish rather than pink. Moreover, the scalp and face are frequently implicated in seborrhœic eczema and very rarely in pityriasis rosea, and recurrence is the rule.

I have seen mistakes made in diagnosing a rather annular type of lichen planus for pityriasis rosea, and again a somewhat indefinite eruption of psoriasis was mistaken for pityriasis rosea.

Treatment.—I notice that Dr. Adamson, in his masterly survey of this disease in Allbutt's "System of Medicine," says that "it is generally agreed that a cure can be hastened by local treatment." Personally, I am not persuaded that it is any more possible to shorten the period of activity of the rash of pityriasis rosea than it is to abort the eruption in the specific fevers. With so variable a course in the normal evolution of the disease as is admittedly met with in pityriasis rosea, it is rather impossible to gauge the effects of treatment. I am entirely in agreement with the desirability of mitigating the irritation, which is sometimes so distressing a symptom, but I agree with Douglas

Montgomery, who found itching present only six times in 38 cases, that it is not common, and at any rate, I am not convinced that any medication, internal or external, shortens the duration of the disease. Opinion is extremely divided on this point. Crocker, in 1893, expressed the view that treatment was unnecessary, but later in life apparently regarded salicin, given internally, as a specific for this disease. Allan Jameson recommends with equal confidence "Condy's Fluid" baths, followed by inunction of an ointment consisting of 3 to 5 per cent. salicylic acid in vaseline.

The theories of causation may thus be summarized :—

(1) The disease has been ascribed to a parasite, identified with the parasites causing ringworm, by Hebra, Kaposi, and some later members of the Viennese school. This view may be regarded as obsolete.

(2) The disease is ascribed to an unidentified parasite, cryptogamic in nature (Vidal, Du Bois, Covisa). Nékám has found Du Bois's parasite but reserves judgment as to its pathogenicity.

(3) The disease is regarded as being of the nature of a specific exanthem, with a special incubation period, a period of evolution, and a period of decline. It is a disease *sui generis*, with its nearest analogies among the specific fevers (Moingeard, Thibierge and others).

(4) The disease is not *sui generis*, but is a stage ("fait de passage") between a number of inflammatory scaly diseases, such as psoriasis, pityriasis rubra pilaris, and psoriasiform parakeratosis (Brocq, Darier).

(5) The disease is the cutaneous reaction to a toxæmic absorption, and may be associated with gastric dilatation, intestinal disorders (Jacquet, Feulard, &c.), indicanuria and peptonuria (Fiocco), the puerperal state (Sherwell).

(6) The disease is caused by irritants, such as damp, ill-ventilated garments (Lassar, Kromayer, Hutchinson).

Some questions which I think may be profitably set for discussion are :—

(1) Is pityriasis rosea a disease *sui generis*? and, if so, what is its nature?

(2) Is the "primitive patch" sufficiently frequently noted to justify its retention as an important element in diagnosis? What is the general experience as regards the time which elapses between its appearance and the wider invasion of the body?

(3) What is the general impression of the Meeting as regards frequency of the disease? The age, season, and sex-incidence? The association with glandular enlargement, and general ill-health? The immunity conferred by a single attack?

(4) Have any members observed with any frequency the presence of micro-organisms which could be regarded as pathogenic?

(5) What is the average duration of the disease, and can it be modified by treatment?

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Dr. LESLIE-ROBERTS (Liverpool) said that in approaching a subject so obscure as this, he thought the first thing to be aimed at was the clear separation of the essential characters from the non-essentials. In his view, there were three characters which could be called essentials. First, there was the rhythm in the development of the disease, which was somewhat remarkable. It progressed by leaps—i.e., a plaque came out, and was followed by a latent or negative phase, during which no eruption appeared. After a short interval, there was another outbreak, followed by another rest, and so on. In other words, the rhythm was periodic, not continuous. Next, it had a cyclical course. It naturally tended to spontaneous recovery—a very important fact. The third essential was the morbid anatomy. The French school were correct in laying emphasis on the fact that the early development of it took place around the dermal vessels—i.e., the perivascular spaces. Perhaps the earliest sign of the disease occurred in the endothelium or the parts surrounding it. Seeing that these were the essential characters, the name “pityriasis” seemed to be an unfortunate one. The name was given in 1860, when the French school was under the influence of the botanists; every disease was then described as if it were a botanical species: a pernicious method which he was glad to say had now been departed from. In no sense was the disease a pityriasis; the desquamation was an accident, the circinate character was of no importance, and that also was an anatomical accident. It was far more closely allied to the toxic erythemata than to the parasitic diseases. Ringed desquamative eruptions on the chest were so common, that in all probability, in many instances, seborrhœids and true pityriasis circinata had been confused with Gibert’s pityriasis rosea. In his opinion, the disease should be separated absolutely from the whole group of pityriasis, and should be allied to the toxic erythemata.

Dr. ALFRED EDDOWES said the remarks of the last speaker attracted his attention very strongly. He remembered the case of a woman who, during pregnancy, showed an eruption indistinguishable from pityriasis rosea, but he then considered it belonged to the erythemata, and named it erythema multiforme. It occurred during two pregnancies. Recently he saw a young lady who had a violent desquamation, with great inflammation about the skin, affecting practically the whole of the body. Dr. Pringle, who saw the case, and he agreed in the opinion that the patient had been erroneously treated for ringworm. He considered that these cases occurred more in spells of warm weather. A week ago he

saw a man who had this affection with desquamation on his arms and face very badly, apparently due to vigorous washing of these parts. There was no rise of temperature, and the patient felt well.

Dr. WHITFIELD said he congratulated Dr. Little on his address and thought it lent itself particularly well towards marshalling the points for discussion. With regard to the age-incidence, he was sorry that he had not kept tabulated statistics to show the age-incidence, but his impression was that his cases would show a rough agreement with the statistics of Dr. Little. As to seasonal influence, he certainly saw more cases in the winter months. He generally began to see some in November and continued seeing cases up to March, after which they died down considerably as a rule. He was particularly impressed with the fact that in the cold, wet summer of 1912 he saw cases all through the summer. He was under the impression that it was the common opinion of the English school that it was a cold weather disease.

He had searched very carefully for Du Bois's parasite, and in doing so had followed the directions very carefully. The result of this method was to produce a mass of artefacts, and he would especially point out that in the specimen which had been sent to Dr. Little, and which was exhibited, the field was crowded with crystals and all sorts of impediments to making an accurate diagnosis. Dr. Whitfield had used every method of staining known to him and had also employed the dark ground, but in none of the rather considerable number that he had examined had he found any parasite. He was rather sceptical about the large parasite which could be seen neither in potash nor by staining, and which could only be found by using a method especially likely to produce artefacts which might be mistaken for parasites.

With regard to treatment, he had been brought up to believe that treatment did not modify the course of the disease, but he was now quite confident that in most cases a tar lotion considerably shortened the attack. He had also tried sulphur ointment, and he believed most of his colleagues would agree with him in saying that this did not shorten the attack, but rather aggravated the symptoms. He might point out in passing that this was very unusual if the disease was due, as claimed, to a superficially situated cryptogamic parasite.

He regarded the disease as a distinct entity, though other diseases, such as so-called seborrhœic eczema, were often confounded with it. The diagnosis might here be easily made by staining scales. The photograph labelled "*Pityriasis rosea gigantea*" which had been handed

round, was, he thought, not pityriasis rosea at all, but a large marginate erythema.

With regard to the primitive patch, he agreed with Dr. Little that it was not so often present as was formerly believed. He thought that they all asked for it so carefully that they obtained a positive history whenever it had been present, and sometimes suggested it to the patient and obtained a history of it when it had not been there. He had seen the very beginning of the attack in one case and he thought this was uncommon, as one generally did not see the case until the eruption was almost fully out. In this case the patient was a medical man and he consulted him because he thought that he had pediculosis pubis. There were a good many No. 5 shot-sized papules scattered over the pubic region and on the inner sides of the thighs, but after a prolonged search he was unable to find nits or pediculi, and he therefore asked the patient to come and see him again in a few days. This the patient did and he was thus enabled to watch these papules develop slowly into patches and rings and finally become a typical pityriasis rosea.

With regard to infection, he had seen two cases in mother and daughter, but the history was not sufficiently accurate as to dates to allow any conclusion as to contagion to be drawn from it. On one occasion only had he seen a second attack, and that was in a middle-aged man who had consulted him twice with an interval of two years between the visits, and on each occasion he had made the same diagnosis of pityriasis rosea after careful examination, scale staining, &c.

He would draw attention to two points as regards the clinical appearances. The first was that there was always some and often considerable urticarial reaction at the edge of the lesions. The scaling, with free edge pointing inwards, did not extend to the edge of the lesion but was always surrounded by this zone of urticarial swelling, which gave a sense of resistance to the finger and caused the faulty diagnosis of syphilis. The second was that extravasation of blood was often considerable enough to leave marked pigmentation, and he was sure Dr. Adamson would remember the case recently shown as a case of anomalous pigmentation, in which both Dr. Adamson and he had made the diagnosis of pigmentation after pityriasis rosea.

Since salicin had been mentioned he might instance the case of a colleague who had been treated for a long period with large doses of salicin, and although it did not interfere in the least with the activity of the disease it interfered considerably with the health of the patient.

Dr. AGNES SAVILL said she had had about thirty cases of the disease. She found the seasonal incidence was markedly at the end of January and during February. On looking over her case-books she was surprised at the number who sought advice in February; and such cases were expected at hospital about that time of year. The range of age of her cases was 11 months to over 50 years. Indicanuria was an indication which she found of little use. She had frequently found it in association with those nerve conditions wrongly termed psychic. Indican was present in so many skin conditions that she was almost surprised when she did not find it. She had been glad to hear Dr. Whitfield speak so strongly with regard to itching, because text-books said either that itching was absent or was of no importance, whereas most cases complained bitterly about the terrible itching. She had had two cases such as Dr. Whitfield described, with marked urticarial lesions underneath the pityriasis, persisting, in spite of treatment, for two or three months. She was strongly of opinion that treatment did cut short the attack; but it was difficult to prove. Once she had had two widespread cases at the same time, identical in character, which she had treated alike; but while in one the attack was limited to a fortnight, the other went on for nearly two months. Still, the one which got better quickly had gone to bed, and carefully followed all directions, whereas the other patient had persisted in going about. She did not think a severe case could be treated satisfactorily while it was ambulant. She always adopted Norman Walker's treatment, permanganate baths once or twice a day, at the beginning, and a mild mercurial ointment. Severe cases, with the body practically covered, cleared up under that treatment in a fortnight.

Dr. ADAMSON said he would endeavour to confine his remarks to the five points set down by Dr. Little for discussion.

With regard to Question 2, he confessed to a weakness for the primitive patch; it was present in about 90 per cent. of the cases, and he thought there was a very definite period of time between the primitive patch and the general eruption. That interval he considered to be about ten days.

In answer to Question 1, he considered pityriasis rosea was a distinct disease. It had very definite features, one of them being the primitive patch, and another the very characteristic distribution—namely, on the chest, a little way on to the shoulders, and a little way on to the thighs. The lesions themselves were characteristic and so was the course of the

disease. The lesion, he agreed with Dr. Leslie-Roberts, was a patch of erythema. It desquamated from the centre, so that in a fully developed patch there were three zones: a central zone, a little yellow and wrinkled; then a ring of desquamation, with the edge of the peeling skin inwards; and beyond this a narrow margin of erythema. In many cases it was almost or quite urticarial.

With regard to the course of the disease, the condition disappeared, if left alone, in from five to eight weeks as an average; sometimes longer.

It had been suggested that pityriasis rosea might be not a disease in itself, but something intermediate between psoriasis and seborrhœa corporis. He thought it was a pity to confuse those three diseases—pityriasis rosea, psoriasis, and seborrhœa corporis—simply because they were scaly: that was going back to the period alluded to by Dr. Leslie-Roberts, when the diseases were classified according to their botanical characters. There were distinct differences between the diseases named; in seborrhœic dermatitis the primary lesion was a follicular papule or immature pustule at the mouth of a hair-follicle; it was of parasitic origin, and easily cured by mild sulphur applications. A patch of psoriasis was scaly all over, not only at the edge like pityriasis rosea, and it had a quite different distribution, attacking the nails, scalp and flexor surfaces, and a quite different course with tendency to recurrence. He did not think there was any reason for regarding pityriasis rosea as a phase of psoriasis or seborrhœic dermatitis.

With regard to the frequency of the disease, from his records during the last ten years he did not think it had varied much; it came to almost exactly 1 per cent. of all the skin cases every year. The proportion of private cases was somewhat higher, because the total of hospital patients was swelled by a number of impetigos and ringworms.

The age-incidence of his cases varied from 2 to 60 years; the commonest age being between 15 and 30.

In the matter of seasonal occurrence, he thought it very erratic; in some years most of the cases would come in the months of July and August, and in another year in the winter months. He had seen quite a number of cases since Christmas, and there seemed at the present time to be an "epidemic."

In the matter of sex-incidence, there seemed to be about two females attacked to one male. He had never found any marked alteration in general health in those who had the disease, and he had not seen a second attack in any patient. He also had searched for micro-organisms in these cases, by many methods, but had never found any.

From the practitioner's point of view, the importance of this disease was that it was always mistaken for syphilis; what troubled the patient most was the intense itching which was often present. He regarded salicin internally as of some use; under its influence the itching stopped, and he thought that the eruption cleared up more quickly than when the patient was left without treatment. He usually prescribed emollient baths and ointments or lotions locally to relieve itching.

Dr. DOUGLAS HEATH wished to relate an experience he had in one case, which developed very acutely in a young lad who had been supplied with a fresh flannel vest to run in a race. Two days later, an eruption, almost comparable to that of scarlet fever, developed, which was made up of very large red patches the size of a sixpence or a shilling. These desquamated in the way typical of pityriasis rosea—with edges pointing inwards; this he regarded as a far better test of the disease than any other sign. In much the same way the desquamation of scarlet fever differed from practically every other form of desquamation in being lamellar. In pityriasis rosea after a few days there was the fine thin scale which contained no organisms; that stage was far more characteristic than the eruption when first seen. His experience agreed with that of Dr. Adamson. He had not kept statistics, but in his practice the warning patch was very common, and had often been the size of a shilling. In about eight or ten days the general eruption appeared. He had found that local treatment benefited the disease considerably. He thought its generalization was so similar that it was largely mistaken for that of seborrhœa. All seborrhœa did not generalize in the same way; sometimes it was very acute and ill-defined, as one might now and then also see in cases of ringworm. He thought many of the large statistics in clinics were due to the inclusion of cases of this feebly developed seborrhœa. He was on his guard against labelling an acute seborrhœa pityriasis rosea. He had seen numerous initial patches of seborrhœa followed by generalization. Sometimes a very small patch in the middle of the sternum, when a boy got overheated (and his experience was that it was commonest in boys at the indiscreet age), was followed by this generalized seborrhœa. In the same way the generalization of eczema often followed a single patch.

In treatment he did not use strong sulphur ointment, as in many people this produced dermatitis; but such a parasiticide as weak

ammoniated ointment, or weak salicylic acid. Acute seborrhœa did very well with 10 gr. to the ounce of salicylic acid ointment, and he thought attacks of pityriasis rosea were also cut short by it. In seborrhœa the head was commonly affected, but in pityriasis rosea it was not. The most valuable diagnostic point between one disease and the other was, in his opinion, the method of scaling, which if present—and it was not in every case—invariably put one on the right track.

Dr. BOLAM said that a glance over his hospital statistics showed pityriasis rosea not to have been at all common, or at least not often diagnosed. The number worked out at about 3 per 1,000. It appeared to be a disease of adolescence. In reference to treatment, he wished to emphasize the remarks of Dr. Whitfield ; he did not think that sulphur and salicylic preparations had a very great effect, but he regarded tar preparations as very useful. Though it might appear to be drastic treatment, good results were obtained from painting with anthracol, or anthracol with acetone. The course could, in this way, be cut short, and the patient could be kept comfortable by ordinary baths.

Dr. MACLEOD said that he had felt much interest in Dr. Little's paper, and the queries at the end of the summary would serve a text for any remarks he had to make.

He agreed that pityriasis rosea was a disease *sui generis*. With regard to the primitive patch, he had obtained a clear history of it and found it so often that he believed it was usually present.

With regard to the frequency of the disease, in the Victoria Hospital for Children, in which children up to 14 years of age were seen, the proportion of pityriasis rosea cases had been about 3 per 1,000 during the last four or five years. He had not got the statistics at Charing Cross Hospital, but his impression was that there the proportion was much the same. Apart from seasonal incidence, he found that the cases seemed to come in groups.

He considered that general symptoms were not infrequently present. Here again the matter might be prejudiced by expecting to find things, but at one time he was much under the influence of Dr. Colcott Fox's teaching, and he was much indebted to that gentleman for what he knew about clinical dermatology. He was often told by patients with this disease that they were out of sorts in an indefinite way, or had a sore throat, or that the neck glands were enlarged.

With regard to the actual cause of the disease, he, like Dr. Whitfield

and Dr. Adamson, had tried to find a specific cause in the scales, but without success. For some time he had believed the disease to be a toxic process, and, histologically, some of the lesions were much more like those of erythema multiforme.

He had found that treatment did shorten the course of the disease, but that it must be of a soothing and palliative type to relieve the itching, which he regarded as a very constant symptom, and that irritating antiseptic applications were harmful. His practice was to use a calamine cream, followed by a bland dusting powder. He had tried salicin in a number of cases, but had not felt convinced that it had any effect on the disease.

Dr. DORE said one of the difficulties in connexion with this disease was its diagnosis. This was not so in typical cases, but in aberrant cases the diagnosis from seborrhœic dermatitis and from psoriasis, and even from erythema multiforme, was sometimes very difficult. He had seen several cases in which there had been not only definite sore throat but also enlarged cervical glands; in two or three cases a definite history was obtained of the patient having taken some poisonous food, such as skate or other fish, immediately before the appearance of a typical eruption of pityriasis rosea. There were also localized cases, with large patches and dark centres, which he thought were more persistent than the ordinary types.

He agreed with Dr. Whitfield that in many cases the lesions were definitely urticarial, and he regarded this as additional evidence for regarding the disease as toxæmic in character.

He had never seen a recurrence of pityriasis rosea, although a medical man had told him he had had two definite attacks.

He (the speaker) had tried many times to make cultures from the scales, but never successfully.

He considered that soothing treatment was of value; but strong irritant drugs, such as strong sulphur or strong salicylic acid, made these cases worse.

Dr. GRAY said he had looked up the figures at University College Hospital for 1912 and 1913. The proportion of cases of pityriasis rosea to all skin cases corresponded to Dr. Adamson's experience—namely, about 1 per cent., or twenty-one cases out of 2,000. Dr. Whitfield's experience in the cold damp summer of 1912 was also borne out at his hospital, for in 1913 there were no cases of the disease during the

summer months, whereas in 1912 there were several; the other cases came in the winter months. With regard to age, Dr. Little's table corresponded roughly also to his experience.

With regard to recurrence, he had seen one undoubted case of the disease which, six years previously, had been diagnosed by the late Dr. Radcliffe Crocker as pityriasis rosea.

In reference to treatment, he systematically put these patients on coal tar and lead lotion, and gave them some inert mixture internally as a placebo. The majority of cases did not come again to hospital; this, of course, might be due to the fact that they were not cured and went elsewhere, but he had found that in the private cases his treatment seemed to answer well, and the eruption disappeared in a week or two.

Dr. PERNET was of opinion—

(1) That pityriasis rosea was a disease *sui generis*.

(2) That the primitive or herald patch was an important feature in diagnosis. It made its appearance in various parts of the body, and would be usually found by looking for it when it had escaped observation by the patient. The time which elapsed between its appearance and the wider invasion of the body was somewhere about a week or so.

(3) That the disease was not so uncommon. No doubt a fair number of cases were not diagnosed, especially mild forms. Others are taken for seborrhœic dermatitis, psoriasis and syphilis. Sex and age did not appear to call for special reference, but in Dr. Pernet's experience he had observed pityriasis rosea more commonly in children and women. He had also seen it in men at various ages. Season appeared to play a part. Just now January-February, 1914) he had had several cases, both in private and at the hospital. Judging from the latter, there did appear to be a seasonable incidence, but on the other hand it might be fortuitous. He had never found much in the way of ill-health, but there was possibly an evanescent slight febrile movement in the early generalizing stage. He had frequently observed a certain amount of adenitis—post-sternomastoid, inguinal, &c.—and the fauces were uncommonly congested; in one instance definite sore throat was complained of. Dr. Pernet himself had never seen the disease recur in the same patient. Nor had he heard of any instance in which the patient had communicated the disease to others, though no precautions as to isolation had been taken, or indeed recommended.

(4) He had never found fungus, though some years ago he had examined several cases from that point of view. He could not confirm Vidal, nor could he agree with the opinions held by the Hebra-Kaposi school.

(5) The disease usually cleared up in three or four weeks, but it might hang fire and last for several months. He thought that treatment did modify the disease in some cases, and he agreed with the late Dr. Radcliffe Crocker, with whom he had observed cases from this point of view, that salicin was useful, as also local treatment.

He desired to call attention to a point of some interest. In three cases he had been able to obtain a Wassermann (original test), and it had turned out negative. This confirmed what Boas and others had found. Naturally, if pityriasis rosea occurred in a syphilitic patient, instances of which he had observed, the Wassermann would probably be positive. In the three cases aforementioned there was no evidence whatever of a precedent syphilis.

The CHAIRMAN (Dr. Galloway) said he first wished to thank Dr. Graham Little for his paper on behalf of the Section. The paper contained the large amount of information which members were accustomed to expect from Dr. Little's contributions, and it would prove of great service to those studying the subject.

Dr. Galloway said that his own impression was that pityriasis rosea must be considered to be a disease *sui generis*, but he wished we could gain a little further knowledge concerning its cause. Further observations giving information as to its relationships with the erythematous group of eruptions on the one hand, or the parasitic squamous dermatoses on the other hand, would be of much service at the present time. He wished that he could have heard more criticism respecting the recent work of those who had observed the presence of bacterial or other fungi in the lesions, especially of the recent work of Du Bois. He thought that the descriptions and drawings illustrating Du Bois's paper, showing the fungus passing into the follicles, were carefully studied; these would require a good deal of explaining away. On several occasions he had examined the lesions for the presence of organisms, but with negative results, and he agreed with Dr. Whitfield as to the cleanness of the scales as a rule. It should also be borne in mind that sometimes large fungi of the hyphomycetal group were difficult to stain. In most cases which came under his observation he used a mild antipruritic treatment, not attempting to bring about strong

anti-parasitic, or antiseptic, effects. Sometimes mild sulphur baths were of use, at other times mild preparations of tar, but perhaps more commonly emollient baths of bran or similar materials, the skin being kept carefully dried and a simple dusting powder free of starch or other organic substances being used.

Treatment on these lines was of much benefit to patients and probably cut short the duration of the disease.

Dr. GRAHAM LITTLE thanked the meeting for the kindly reception of his paper. He had been much interested in Dr. Whitfield's remarks as to the increased frequency of the disease in the wet summer of 1912. He had examined his notes of cases for that year. There had been one in February, three in April, three in June, five in July, one in August, one in September, one in October, two in November, and one in December. But the wet weather had been chiefly in August and September. Dampness of atmosphere had been regarded as a contributory cause by many observers, as had been mentioned in the text of the paper. He found difficulty in agreeing with Dr. Leslie-Roberts that the disease was allied to the toxic erythemata, of which urticaria and erythema multiforme might be taken as types. Recurrence was here the rule. His own view leaned to the identification of this disease with the exanthemata, notwithstanding the difficulties which that hypothesis had to meet. He welcomed Dr. MacLeod's statement as to the frequency of general symptoms of illness associated with the eruption. Dr. Bolam's experience confirmed the impression that there were geographical zones of frequency, an experience which he believed was corroborated by Dr. Leslie-Roberts, who found the disease comparatively infrequent in Lancashire.

Dermatological Section.

March 19, 1914.

Dr. J. J. PRINGLE, President of the Section, in the Chair.

Case of Extensive Carcinoma of the Face occurring in the Course of a Xerodermia Pigmentosa treated by a Massive Dose of Radium.

By J. J. PRINGLE, M.B.

THE PRESIDENT trusted that he might not be considered as straining his presidential prerogative in contravening a recommendation of his own suggestion by reading an epitomized version of his notes of the case now exhibited. The necessity at the present time for absolute precision of statement and for scrupulous caution in drawing conclusions in all matters connected with the therapeutic use of radium had prompted him to adopt this unusual course. He regretted that he was compelled to present the case to the Section before its completion, but he was forced to do so owing to a sudden and invincible desire on the part of the patient to return to his home.

The patient, E. P., aged 20, was a labourer living near Bury St. Edmunds, who was sent to the Middlesex Hospital on December 16, 1913, by Mr. Robert H. Lucas, of Bury St. Edmunds. He was the youngest of a family of three, all males, and he stated that his eldest brother, aged about 30, had always been deeply freckled on the hands and face, but not nearly so severely as himself. His second brother was not freckled at all. No other member of the family was similarly affected and his father and mother were not family relations. With the exception of his present complaint the lad had always been robust, earning his livelihood as an agricultural labourer. He was sturdily built and of average intelligence.

For present purposes it would suffice to state that he exhibited a typical and severe example of xeroderma pigmentosa, all the cardinal symptoms of which were markedly in evidence—viz., freckle-like pigmentation, patchy atrophodermia, stellate and linear telangiectases, warty excrescences, ulcerations, and ultimately papillomatous and carcinomatous growths. The disease was apparently noticed at about

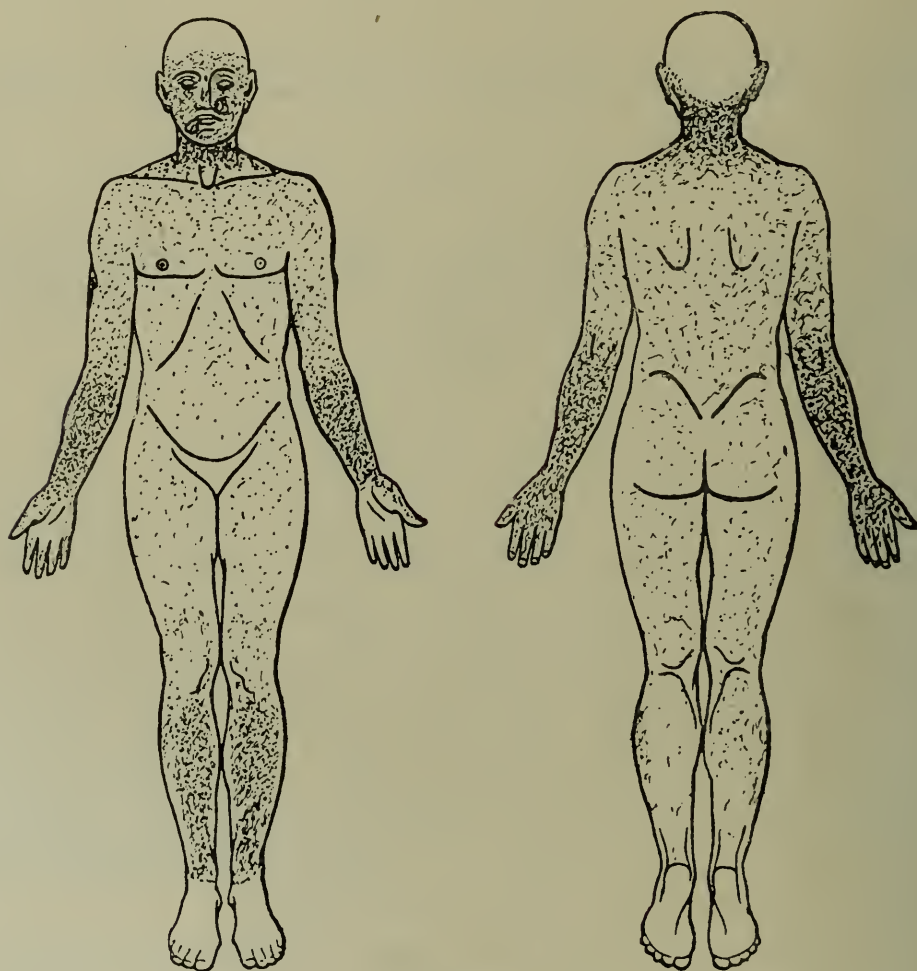


FIG. 1.

Distribution and relative density of pigmentation.

the age of 2 on the face. The accompanying schema roughly illustrates the distribution of his pigmentary disorder (fig. 1).

Since its origin the condition had been uniformly progressive and the patient had been admitted no less than eleven times to Bury St. Edmunds Hospital to have what he called "blisters" scraped from his face. The scars resulting from these operations were especially manifest on the cheeks and below the eyes. He had ectropion of both

lower lids and marked pannus of left eye. He was for six months in hospital in the year 1912 and stated that he received X-ray treatment every other day for a period of two months.



FIG. 2.

Condition on admission, December 17, 1913

The grave and important feature of the case consisted of two large carcinomatous masses, the bigger of which occupied the region of the left cheek and its induration extended to and involved not only the

whole of that cheek as far back as the zygoma, as far down as the level of the angle of the mouth, the whole of the left half of the upper lip and the left side of the nose—completely blocking the nostril—but also extended deeply to involve a very large portion of the upper maxilla and projected into the buccal cavity between the cheek and the jaw, so that it was impossible for the patient to separate his teeth.

There was also a large carcinomatous ulcer with dense, rodent-like margins, involving the right angle of the mouth and the outer half of the right side of the chin (fig. 2). In face of the nature, localization, and extent of the disease no surgical procedure appeared to be likely to yield favourable results. It was, therefore, decided to have recourse

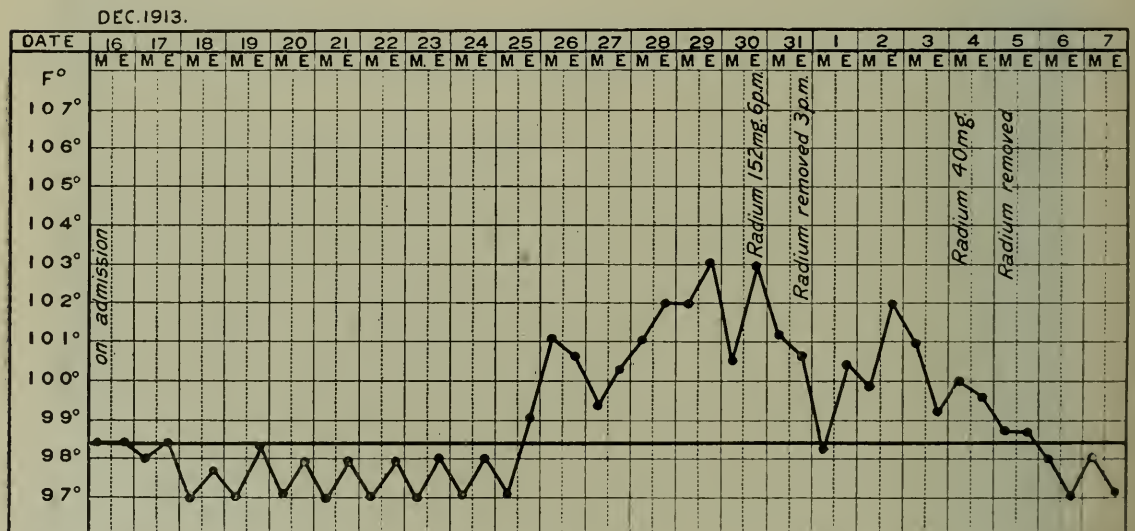


FIG. 3.

Temperature chart showing septic process.

to the employment of massive doses of radium, 152 mg. of which were available, especially as microscopic sections of excised portions of the growth had proved to be a squamous-celled carcinoma, a form of malignant disease specially amenable to such treatment.

On December 25 a grave complication occurred in the form of an acute septic infection accompanied by high fever and much malaise, the origin of which could not be determined. The temperature chart (fig. 3) indicates a septic process beginning on December 25, attaining its maximum, 103° F., on December 29 and 30, and subsiding to the normal on January 5 despite—or perhaps in consequence of—the procedure now to be described. The condition resulting from this

septic attack is illustrated in fig. 4, which shows that the carcinomatous mass situated in the left cheek and upper lip had broken down and ulcerated extensively so as to produce hideous disfigurement. Ulceration also occurred in the buccal portion of the growth, as the result of which the mouth was constantly filled with a foetid discharge.

Notwithstanding these happenings, it was decided after much consideration to insert the entire radium available into the substance of the growth. Consequently, at 6 p.m. on December 30, three tubes containing respectively 90 mg., 40 mg., and 22 mg. of radium bromide



FIG. 4.

Condition on December 29, after septic infection, before the use of radium.

were introduced into the growth, screened in such manner as to permit of the penetration of the gamma rays only into the tumour. The tubes were removed twenty-one hours afterwards. Considerable hæmorrhage occurred at the time of insertion of the tubes, but soon ceased. The patient had a comfortable night and as early as on the following day it was noted that the density of the infiltration surrounding the ulcerated area had already greatly diminished.

On January 4, a tube containing 40 mg. of radium bromide was placed transversely on the surface of the growth at the right angle

of the mouth and kept in position there for twenty-four hours. This procedure was much less satisfactory than that of the interstitial insertion of the radium into the growth of the cheek; a tube containing 40 mg. of radium was therefore introduced through the substance of the base of the ulcer on the chin on February 12, the result of which had not yet become mature.

The following effects of the radium treatment of the growth of the left cheek were manifest:—



FIG. 5.

Condition on March 19, 1914, after radium treatment.

- (1) There was a great reduction in size of the ulcerated area.
- (2) There was almost complete subsidence of the previously existing and widespread induration surrounding the growth.
- (3) The tumour no longer projected into the mouth; the jaws could be widely opened; the left nostril was quite patent; there was complete cessation of the discharge into the mouth, and the finger could be freely introduced between the cheek and the gum, which was apparently healthy.
- (4) An interesting phenomenon was presented by the remarkable diminution in the abnormal pigmentation all over the irradiated area.

The improvement in the general condition was evidenced by the fact that since the date of his first radium treatment the patient had gained a stone in weight.

It was a matter for regret that deep necrosis involving the outer wall of the antrum of Highmore persisted. The cavity resulting from this was, however, slowly filling up.

The President desired to acknowledge much kindly help and valuable advice from Mr. Clifford Morson, Registrar to the Cancer Department of the Middlesex Hospital.

Sir MALCOLM MORRIS congratulated the President on the result of his treatment in such a severe case. With regard to the use of radium, from his own experience he would say there was no question that if the radium were introduced into the very substance of the tumour, so that the radiations could pass through the diseased part in all directions, a good result was much more likely than if the radium were merely allowed to act from the surface. He had seen several cases in which that was borne out. The risk in some cases was that attaching to introducing the tube too deeply into the tissues, and so encountering important vessels; hence care was necessary. In one case he saw considerable hæmorrhage after the introduction of a radium tube, so that the patient's life was, for the time, endangered.

Case of Mycosis Fungoides à Tumeurs d'Emblée.

By J. J. PRINGLE, M.B.

THE PRESIDENT was indebted to his colleague Sir Alfred Pearce Gould for his kind permission to exhibit this case before the Section. It was his original intention to show it as a case for diagnosis, but he ventured to exhibit it now after further study as an example of the rare form of mycosis fungoides known as mycosis à tumeurs d'emblée. This opinion was obviously open to criticism.

The patient was a master mariner, aged 48, who hailed from Avonmouth near Bristol. His health until June, 1910, was excellent. In that month he received a severe blow from a barnacled spar on the top of his head, which caused a long and deep scalp wound. The wound received no skilled attention and a growth or "scud" formed at its edge, which at the end of six months had attained the size of a Barcelona nut.

Fifteen months after the accident the growth was said to have been the size of a walnut; he stated that it was then scraped daily for two months, and about Christmas, 1912, lunar caustic was applied. Soon afterwards numerous large swellings appeared behind his ears and in the occipital region of the scalp, which apparently subsided spontaneously. In the early part of 1912, however, numerous horny lumps made their appearance all over the scalp, for which he was admitted to Bristol General Hospital, on May 30, 1912, under the care of Mr. Ernest Hey Groves.



FIG. 1.

Case of mycosis fungoides.

Mr. Hey Groves reported that he then presented an exuberant very septic fungating growth at the vertex of the scalp measuring about 3 in. by 4 in., which he excised widely, afterwards applying skin-grafts. He subsequently repeated a similar procedure on other tumours in various situations on the body and limbs (axillæ, loins, rectum, &c.), on certainly not less than sixteen occasions, and the immediate local result was always satisfactory, although fresh growths continued to make their appearance on previously healthy skin, especially upon the scalp. A few small nodules which were

treated by cautery and carbon dioxide snow all recurred soon afterwards *in loco*. Repeated microscopical examinations only revealed the presence of granulomatous tissue with many giant cells and no specific micro-organism was ever detected. The Wassermann reaction was consistently negative and an injection of salvarsan seemed to aggravate rather than ameliorate his condition. The photograph (fig. 1)

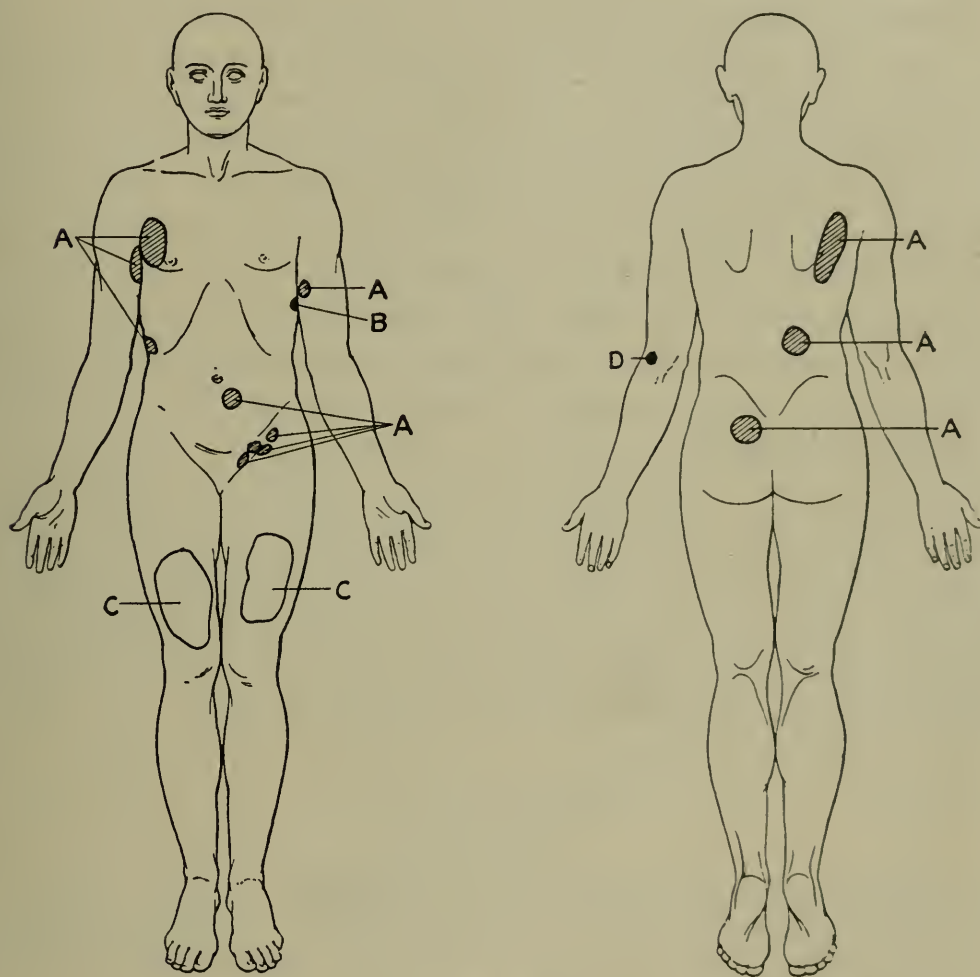


FIG. 2.

A, operative scar; B, small tumour, said to be disappearing; C, skin taken for grafts; D, hemispherical tumour.

shows the condition on his admission to the Middlesex Hospital, on February 23, 1914. The accompanying schema (fig. 2) indicates roughly the position of numerous scars resulting from previous operative procedures. The patient stated distinctly that at least two considerable growths on his thighs and one on his left arm disappeared spontaneously. A recent hemispherical tumour dating from December,

1912, and arising abruptly from healthy skin and about the size of half a filbert, was present on the outside of the left elbow. A very large portion of the scalp was replaced by sound scar tissue upon which the growths had never appeared. The recent phases of the disease were represented by very numerous hemispherical projections, the smallest of which were the size of a split pea. By the aggregation of these, large tuberous masses were formed, which ulcerated, fungated and discharged slightly. As can be seen in the photograph, the largest of the masses were situated in the right supra-orbital region and in the pre- and post-aural regions. There were nowhere present any of the changes, either erythrodermic, lichenoid, psoriasiform, or eczematoïd, which could be regarded as a pre-mycotic condition. There was no enlargement of the spleen nor of the inguinal, cervical or axillary lymphatic glands. The patient complained of intense itching in the tumours on the face and scalp. He was in good general condition, his urine presented no abnormality and he showed neither signs nor symptoms of any internal organs. Three weeks ago he received three full pastille doses of the X-rays.

Although their microscopical and bacteriological examination was not yet complete, the President was at liberty to state that the growths—a large mass of which, conspicuous in the photograph shown, was excised for this purpose—were pure granulomata containing large numbers of streptococci; but apart from these no specific recognized pathogenic micro-organism had been detected in them.

DISCUSSION.

Dr. PERNET agreed with the President's diagnosis. He read a paper on a case treated by salvarsan, at the International Medical Congress last year, and stated therein his view that salvarsan apparently aggravated the condition. He had found that patients suffering from mycosis fungoides frequently had a history of longevity in one or both parents, and he asked if it was so in this case.

The PRESIDENT replied that the man's father died at the age of 83, and his mother in her 82nd year.

Case for Diagnosis ; (?) Dermatitis Artefacta.

By G. NORMAN MEACHEN, M.D.

THE patient, a young lady, aged 23, was sent to the exhibitor by Dr. Arthur E. Giles, under whose care she had been for severe metrorrhagia, for an obstinately recurring eruption upon the face. In December, 1912, she first noticed a burning and tingling upon the cheeks, and reddened spots would appear which did not, apparently, become blisters, but became "dry and sore." The whole skin of the face would burn after exposure to wind. She had never had any skin disease, but her mother had suffered from eczema. The hair was normal, and the complexion fair. She had used several different kinds of toilet soaps, but none of an irritant nature. On examination, there were several discrete, rather sharply defined reddish spots, the size of a sixpence, situated upon the cheeks and sides of the mouth. One, in process of formation, was papular, and situated upon the right side of the nose. The areas would last for a few days and then gradually fade, but there was neither bulla formation nor exudation. No scarring, even of a superficial character, was manifest. She had been curetted twice, and she stated that the spots would be better for a time after the operations, and then they would reappear. The exhibitor suggested the possibility of a dermatitis artefacta, or of a very superficial type of lupus erythematosus, but he invited the opinions of the members of the Section.

The general opinion expressed by the members was that it was a case of dermatitis artefacta.

Case of Angioma Serpiginosum.

By GEORGE PERNET, M.D.

THE patient was a girl, aged 15, who was first seen at the West London Hospital on March 3, 1914. The complaint was of two years' duration. It had begun about the left axilla, and gradually spread down the left arm, the last part involved being the dorsal aspect of

the first phalanx of the left middle finger. About the left axillary region there were areas of pale fawn discoloration, something like a *tinea versicolor* in appearance, with a certain amount of superficial atrophy. The lesions were originally red and vascular, like those down the left limb, which presented a number of characteristic vascular areas with the "cayenne pepper like" points described in the cases already published, some twenty-five in number.¹

DISCUSSION.

Sir MALCOLM MORRIS said it was desirable to have a full record of the case, because instances of the condition were so rare. The remarkable feature was the way in which the lesions spread towards the fingers. He would like to hear suggestions as to the pathology.

Dr. ADAMSON thought that these cases of *angioma serpiginosum* belonged to the group of systematized or zoniform *nævi*, of which the unilateral verrucose linear *nævus* was the best known form. Systematized *nævi* might be composed of other elements than warty growth. They might be made up of sebaceous glands or of pigment or blood-vessels. Examples of each of these forms of "unilateral *nævi*" had been shown at meetings of the Society by the speaker. The segmental distribution of the vascular tufts in the present case was striking—they occupied a limited area on one side of the chest, stopping short at the middle line in front and behind, and they extended in a band-like manner down the arm. A similar zoniform distribution was described in nearly all the published cases of *angioma serpiginosum*. That the lesions were not present at birth, and that some of them faded while fresh ones appeared were facts quite consistent with the idea of unilateral linear *nævus*. In the more ordinary type of verrucose zoniform or linear *nævus* the lesions sometimes appeared at the tenth year or later, and the speaker had shown a case in which when shown several years later the greater part of the *nævus* had disappeared.

The PRESIDENT was in accord with Dr. Adamson's general conception of the term "*nævus*," but he thought there was some difficulty in bringing a condition such as the present, which developed and disappeared spontaneously in early adult life, within the category. The point was an extremely delicate one.

Dr. DORE said he could not agree with Dr. Adamson's suggestion, because linear *nævus* was not an *angioma*.

Dr. F. PARKES WEBER said that (to the naked eye) in these cases the appearance was similar to that of the congenital finely pencilled or mottled

¹ *Vide* Wise and Pollitzer, *Journ. of Cutan. Med.*, New York, 1913, xxxi, pp. 725 and 916, with plates.

telangiectatic patches which really belonged to the class of vascular (hæmangiomaticous) nævi. Some conditions described as "livedo reticulata" or "livedo annularis" belonged to the same class. But it would be stretching the term "nævus" very far to include under it cases like that shown by Dr. Pernet, in which the curious linear telangiectatic condition had developed so long after birth.

Dr. EDDOWES said he assumed that Dr. Pernet drew a distinction between this case and cases of spider nævi seen on children's faces. He once attended a family of children, all of whom were liable to bleed very much from these telangiectases when they were towelled roughly—especially after a hot bath.

Dr. PERNET replied that the patient had been under his care only since February 3. According to the mother, the disease began as a bright vascular condition, and then spread gradually downwards. In reply to Dr. Adamson, he did not consider this case belonged to the nævus category; he would reserve the term "nævus" for congenital conditions.

Case of Multiple Lupus Vulgaris involving Skin and Mucous Membranes.

By GEORGE PERNET, M.D.

THE patient was a boy, aged 15, with a history of two years' duration. There were numerous patches and foci of lupus vulgaris scattered about the face and limbs, especially the legs. The disease had started on the right arm. The palate and nasopharynx were also involved. For these the patient had been under Dr. H. J. Davis, in the Throat and Nose Department of the West London Hospital. The boy was first seen by Dr. Pernet, in the Skin Department, on January 17. He had had X-rays previously to this, and was having more. In addition, tuberculin injections were given, owing to the involvement of the mucous membranes. The multiple lupus vulgaris lesions did not follow measles or other acute exanthem.

Case of "Multiple Subcutaneous Fibromata."

By S. E. DORE, M.D.

THE patient, a German clerk, aged 28, noticed a small lump on the outer surface of the knee four or five years previously. This disappeared, but reappeared eighteen months ago, and at the same time similar tumours formed on the elbows, palms and scalp. The lesions were firm, rounded, painless subcutaneous nodules varying from a pea to a walnut in size. There were four or five on each arm below the olecranon process, the majority projecting visibly, and being freely movable under the skin, but there was a small prominence—possibly of a different character—on the right arm, which was firmly adherent to the bone. In the centre of each palm there was a small group of smaller and flatter nodules, and two or three on the scalp behind the ears. With the exception of one over the head of the right fibula, the nodules were strictly symmetrical. There was no pigmentation of the skin or tenderness in any of the tumours. The patient was apparently in perfect health, and had never had any symptoms of rheumatism, and no member of his family had been similarly affected. Sections of a nodule from the arm showed coarse fibrous tissue, with evidence of slight degeneration in parts; numerous vessels and areas of endothelial and small round cells.

Dr. Parkes Weber had kindly seen the patient, and had called the exhibitor's attention to a similar, but less extensive, case he had shown at the Medical Society of London in 1907.

DISCUSSION.

The PRESIDENT said Fellows would probably remember a case recently shown by Dr. Sequeira, in which nodules were present in the palms, seemingly identical with those exhibited, which had been exclusively demonstrated to be neurofibromata. Many of them were painless, and he would like to know whether Dr. Dore had excluded the possibility of their identity in nature with Dr. Sequeira's case.

Dr. F. PARKES WEBER said there was a scattered literature which described "fibrous nodules" about the elbows, &c., sometimes with the suggestion that they were associated with, or allied to, rheumatoid arthritis. In Dr. Dore's case

there were, however, also symmetrical nodules in the palms of the hands, resembling, in regard to their position, those sometimes seen in children with "rheumatismus nodosus," that is to say, the form of subacute rheumatism characterized by the presence of subcutaneous "rheumatic nodules." The situation of the nodules in the palms of the hands likewise reminded one of the fibrous change in Dupuytren's contraction. He did not think the present case could be one of neurofibromata or of any kind of neuromata.

Mr. T. P. BEDDOES said that a case was shown recently at the Section for the Study of Disease in Children¹ in a child 7 months old, in which sections were made and were found to consist simply of connective tissue. Such cases resembled, in distribution and feel, multiple subcutaneous cysticercus; which, without excision or puncture, might be diagnosed as fibroma until their nature was recognized by subsequent brain symptoms.

Dr. DORE replied that he did not think it was possible quite to exclude the presence of nerve-fibres from these tumours, but they were not painful and the sections did not show any nervous elements, although they had not been specially stained for this purpose.

Granuloma Annulare with Subcutaneous Nodules.

By A. M. H. GRAY, M.D.

THE patient was a child, aged 4, apparently in good health. There was slight glandular enlargement in the neck. The lesions from which the child was suffering first appeared nine months ago on the buttocks, and had slowly increased in size; subsequently, lesions had also appeared on the left knee. At the same time as the earliest lesions a nodule appeared on the back of right elbow, and another on the front of the right shin. The mother stated that these lesions first commenced like those on the buttocks, but subsequently became hard nodules. The lesions on the buttocks and left knee were purplish erythematous rings, varying in size from a pea to a shilling, the larger ones showed central involution; the patches were very infiltrated, and showed a rather irregularly nodular edge. Over the upper part of the right ulna, near the olecranon, was a nodule the size of a pea, of very hard consistence, situated in the subcutaneous tissue and corium; it projected slightly

¹ *Proceedings* (Child. Sect.), p. 88.

² Choyce, "System of Surgery," 1912, i, p. 603.

above the level of the surrounding skin, and the skin over it was reddened. A similar and slightly larger nodule was present over the upper part of the right shin; this was more deeply placed, but was fixed to the deep layers of the skin. There was very slight projection, and the skin was not reddened.

The case was shown for diagnosis; the exhibitor was not able to explain the association of the deep-seated nodules with the erythematous rings, and had thought that the lesions might be tuberculides. It appeared, however, that most members who had seen the case had no doubt that it was a case of "granuloma annulare," and Dr. Graham Little had told him that he had seen subcutaneous nodules present in such cases. He was therefore prepared to accept this diagnosis.

DISCUSSION.

The PRESIDENT and Dr. ADAMSON expressed their concurrence in the belief that it was granuloma annulare.

Dr. GRAHAM LITTLE recalled a case which he had published in 1908,¹ in which an exactly similar association had been noted of granuloma annulare with nodules which were regarded as tubercular. In this case (No. 49 of the series alluded to) a nodule had been excised and injected into a guinea-pig without producing tuberculosis; but the patient had undoubted tubercle, and this had progressed characteristically since then.

Acne Agminata with Bilateral Enlargement of the Lachrymal Glands.

By A. M. H. GRAY, M.D.

THE patient, a robust man, aged 39, had been in good health up to the present time. He had an accident in November, 1913, and was laid up in Woolwich Arsenal Infirmary with a crushed foot. During the second week in December, while still in the Infirmary, spots came out on his face, and had been coming out since this date; a few also had appeared in other parts of the body. The spots came out without any pain or irritation, and gradually increased in size and then disappeared, each spot taking about eight weeks to run its course.

¹ *Proceedings*, 1908, i, p. 47.

When examined the eruption was seen to be distributed symmetrically over the face, the lesions were pinhead to lentil-sized papules, which could at first be felt rather than seen in the depth of the skin, subsequently they become more prominent and purplish-red to brown-red in colour; a few of them showed a small central yellowish point when fully developed, which looked like a small central pustule, but they did not discharge pus nor ulcerate; later they might develop a thin transparent scale on the surface, and finally they disappeared, leaving a pigmented atrophic spot. Many of the well-developed lesions if examined with glass pressure closely resembled lupus nodules. To the touch the lesions were distinctly shot-like. The papules were distributed all over the face, being particularly numerous on the sides of the nose, the naso-labial folds, the lower eyelids, the upper lip and sides of the face; the forehead, especially about the temples, was affected, and the papules were larger here than on the face; the lesions also encroached on the hairy scalp for a short distance. Lesions were also present on the margin of the ears and in the mastoid regions. There were isolated papules on the upper part of the chest, on the left forearm, on the right thigh, on the penis, and in the gluteal fold. One papule involved the mucous membrane of the upper lip. In none of the papules was it possible to say that they were definitely perifollicular. There was definite enlargement of both lachrymal glands which had slightly diminished in the last six weeks. There was no enlargement of the salivary glands. There was, however, definite enlargement of the lymphatic glands in the neck.

In other respects the patients showed no departure from normal health. The blood showed no abnormality, urine was normal. The Wassermann and von Pirquet reactions were both negative. The patient had had four children, one of whom had suffered from tuberculous glands, but otherwise there was no history of tuberculosis in the family. There was no history of venereal disease.

One of the papules from the chest had been removed and sections cut. It showed the presence of masses of cell infiltration in the deeper layers of the dermis, these masses were separated from each other by normal-looking connective tissue. The cell masses were mostly composed of large pale epithelioid cells with faintly staining nuclei, but lymphoid cells were also present in considerable numbers, especially at the periphery of the cell masses; plasma cells and leucocytes could also be seen in this region, and numerous spindle-shaped connective tissue cells were found among the epithelioid cells. Giant cells were numerous.

and many of them had peripherally arranged nuclei. One of the cell groups seen in the section had formed round a hair-follicle, but did not appear to have involved it. Another cell mass had a sweat-duct running through it which was also unaffected. Some of the arterioles in the neighbourhood of these cell masses showed definite perivascular infiltration.

The case was shown firstly to obtain the opinion of members of the Section, many of whom had doubtless seen the original cases of Crocker, as to whether this should be labelled "*acne agminata*." Secondly, if members agreed that this was so, the exhibitor wished to express the view that the "*acne agminata*" of Crocker was identical both in clinical and histological characters with the papular form of "*miliary lupoid*" or "*multiple benign sarcoid*" of Boeck and Darier. It was true that Crocker mentioned the fact that suppuration sometimes occurred in "*acne agminata*," while this did not appear to be a feature of "*miliary lupoid*," but in the former it was clearly stated that there was no tendency for the papules to break down into ulcers. In the present case one or two small pustules had been present from time to time, but there appeared to be a secondary folliculitis, and in no case had there been any ulceration or even discharge of the pus. This might possibly account for the slight differences noted in cases described under the names "*miliary lupoid*" (papular form), "*acne agminata*," and "*acnitis*." Thirdly, there arose the question as to the tuberculous nature of the lesions. In this case the tuberculin reaction was absolutely negative, and this had been found to be so in other cases. It seemed to the exhibitor to be a very important point, as the demonstration of tubercle bacilli and animal inoculation experiments were frequently negative, even in admittedly tuberculous lesions. It was certainly doubtful at the present time whether there was sufficient evidence to class these lesions as tuberculides. Lastly, the case was of interest on account of the enlargement of the lachrymal glands: this enlargement appeared to be inflammatory, as there had been some diminution in size since the case was first seen. The exhibitor had been unable to trace this combination of symptoms in any other recorded case, nor had he been able to find it in association with tuberculosis.

DISCUSSION.

Dr. DOUGLAS HEATH agreed with the diagnosis of *acne agminata*; he considered the grouping of papules on the lower eyelid was characteristic of the disease, confirming Crocker's original description. The only two cases of the condition he had had under care were in men of about the same age as this patient, about 40. They also gave a negative von Pirquet reaction. Inoculation into a guinea-pig gave negative results as regards tubercle. The morphology was the same as that now described by Dr. Gray. The distribution on the eyelids was against other forms of *acne*, and against ordinary multiple subcutaneous lupus of the face.

Dr. PERNET agreed that this case belonged to the category of *acne agminata*, of which he had seen several examples. He had found in some cases that the occupations of the patients led to their perspiring a great deal. This man, he ascertained, was a stoker, and manipulated five or six tons of coal a day. The glare of the fires and heat-rays might account for the inflammation of the lachrymal glands. From the cases he had seen, his conclusion was that it was a sweat gland trouble. He did not associate these cases with tuberculosis. He had microscopically examined a nodule from a case of *acne agminata* some years ago and found the primary and chief change occurred about the sweat coils, which were disorganized by leucocytic infiltration. Some of the hair-follicles were partially involved also. He had not found any tubercle bacilli.¹

The PRESIDENT remarked that the nature of this curious disease was brought up last year apropos of a very marked case shown by Dr. MacCormac.² He thought the lesions in this case were extremely like small necrosing tuberculides on the extremities as well as on the face. He regretted the name, because the condition was certainly not an *acne*, as it was not exclusively connected with the sebaceous glands. Neither was it necessarily *agminate*. He confessed that he still leaned to the idea of it being a *toxi-tuberculide*. It certainly occurred independently of excessive sweating or of any occupation which caused that unpleasant state. He had recently had a well-marked case in a young lady of good social position, which had been successfully treated by Dr. Dore by X-rays.

Dr. GRAY replied that what appeared to be the main argument against tuberculosis was the negative result to various forms of tuberculin reaction. He knew that it was difficult to say how definite or accurate any form of tuberculin reaction was, but considering the frequency with which tuberculin reactions were positive, even in patients who were not the subjects of gross tuberculous lesions, it was extraordinary that, if these lesions were tuberculous, a constant positive reaction was not obtained. Another point

¹ Radcliffe Crocker's "Diseases of the Skin," 3rd ed., 1903, ii, p. 1097.

² *Proceedings*, 1913, vi, p. 45.

against the tuberculide idea was, that though it was possible that tuberculides on the face might show less tendency to break down than when occurring on other parts of the body, yet when these lesions occurred on other parts of the body they took on the same characters as when on the face, and they did not resemble the tuberculides usually met with, say, on the arm. Darier, in his "Précis de Dermatologie," was inclined to class acnitis with the hypodermic tuberculides. The most marked feature in tuberculides was their tendency to break down, and their tardiness in healing, as well as the fact that they left a pitted scar. When these lesions occurred on the body or limbs they did not do that. This condition usually occurred in robust people, and he did not think sufficient evidence had been adduced to prove that they were tuberculides.

Recurrent Bullous Eruption on the Legs.

By A. M. H. GRAY, M.D.

THE patient, a man, aged 53, had suffered from lesions of the skin for some twenty-five years. For the last twelve years he had had blisters breaking out on the legs more or less continuously, but, before this, ulcers, not preceded by any blisters, used to form chiefly on the thighs and legs, but also on the upper limbs. He was seen by Dr. Radcliffe Crocker in 1909, and was said to have a tuberculous granuloma on the left leg, $1\frac{1}{2}$ in. by 1 in. in size. He had been subject to enlarged glands in the neck for many years past, they were noted in 1909, and when first seen by the exhibitor about a year ago he had a discharging sinus in his neck from a ruptured glandular abscess, and had also signs of active pulmonary tuberculosis. At the present time the pulmonary trouble was more or less quiescent, no tubercle bacilli could be found in the sputum, and the patient's general health had improved, but he still had enlarged glands in the neck. There was no history of syphilis, and Wassermann and luetin reactions were negative. There were no marked blood changes and no eosinophilia. The patient was found to have numerous large irregular scars on the thighs and legs, a large scar on back of left elbow, and several small pitted scars about the forearms. The large scars on the thighs were superficial, thin, and had a very irregular outline: scattered through these scars were numerous pinhead-sized yellow raised spots. The active lesions at the present time were of the vesicular and bullous type. During a stay of some weeks in hospital numerous lesions had come out; they were mostly of two types, small red pinhead to pea-sized bright red patches, non-infiltrated,

becoming vesicular, or large bullæ varying in size from a pea to a walnut, containing at first clear fluid which rapidly became purulent. These bullæ and vesicles dried up and often left behind a pigmented atrophic area.

Histologically the smaller lesions showed marked changes in the vessels of the papillæ and papillary layer of the skin. There was marked endo- and perithelial proliferation and an exudate of fluid and leucocytes which passed through the rete mucosum, and tended to collect in the region of the granular layer of the epidermis which had been broken up and destroyed in the area affected: a vesicle was thus formed between the horny layer and the rete.

The case was shown with the idea of obtaining an opinion as to the nature of the lesions. The exhibitor wished to make the suggestion that they might be tuberculides, but he was unable to find such cases described, and he had no evidence to go on beyond the fact that the patient was undoubtedly suffering from tuberculosis of a more or less severe type, that the lesions had recurred for many years, and that some of them left definite atrophy. The sections did not suggest tuberculosis, and no tubercle bacilli had been found.

The exhibitor also called attention to a section of one of the old scars on the thigh, showing that the small yellow nodules seen were composed of small masses of elastic tissue just beneath the epidermis.

DISCUSSION.

Dr. DOUGLAS HEATH said that tuberculous patients were particularly prone to lesions of this kind. When lupus cleared up, one frequently found impetiginous bullæ on the areas where the lupus had been. He thought the reason was that in those situations the skin was vulnerable to the inroads of streptococci or staphylococci. Some might be due to rubbing, the infection coming from other centres. He could not see any areas of healed tubercle in this case.

Dr. ADAMSON thought it bold of Dr. Gray to suggest tuberculide in this case, for he did not consider there was any clear evidence to support it. He would have first thought of the scars as those of tertiary syphilis. The other condition on the leg might be a chronic streptococcal infection.

The PRESIDENT said he would not have thought of tuberculosis in looking at the legs of the patient. If it were tubercular it corresponded more closely with the condition labelled in the St. Louis Hospital, Paris, as "tubercular lymphangitis," than with any other type. But it was not accompanied by elephantiasis, which was, he thought, always present in such cases.

Dr. GRAY replied that he had no views as to what the scarring was caused by. He only had the help of Dr. Crocker's diagnosis from the single lesion on the leg. The case reminded him of another which he exhibited as "(?) potassium iodide eruption," in June, 1912.¹ He has since come to the conclusion that this diagnosis was incorrect, as recurrence had taken place without the exhibition of potassium iodide. The appearance of some of the lesions on the legs was almost identical with those in this patient; there were also marked pulmonary lesions and suppurating glands in the neck, as well as severe nephritis. There were numerous small red spots with central vesicles on the legs associated with other ulcerating lesions. Dr. Whitfield expressed the opinion that they might be tuberculous. He therefore thought tuberculous might be a definite ætiological factor in this case also. The idea that it might be streptococcal entered his mind, but dressing the lesions with 1 in 4,000 perchloride made no difference to them. He therefore thought it unlikely that the lesions were impetiginous.

Case of Nodular Leprosy.

By A. WINKELRIED WILLIAMS, M.B.

PATIENT, a soldier, aged 28, was born in India; left as a child; served in Army in India, 1904-05; left India, 1905; served in South Africa, 1905-09. First symptom noted, painless ulcer on knee following knock at football; treated in hospital and took four months to heal in 1906. No prodromal feverish attack. Dark patches on forehead noted in 1911; no fever, &c. Gradual progress to present time. Treated in Army from time to time, but no special internal treatment. Local application of tinct. iodi. Knocked knee against motor-car about one month ago; no pain, but a few days later he noticed the ulcer.

Present condition: Protuberance of eyebrows, broadening of nose, swelling of ear-lobes; marked infiltration of skin by small nodules over entire face. Profuse nasal discharge containing clumps of *Bacilli lepræ*. Section of nodule from chin, typical infiltration (microscopic): L. cells and bacilli. Cyanotic swelling of hands. Body: Diffuse flattened nodules and areas of pigmentation and brownish-yellow to white areas. Pain sense not acute anywhere. Anæsthesia more or less marked on flexor aspect of arms and anterior aspect of lower extremities above and below knee for about one-third of thighs and legs. Anæsthesia of arm more marked on ulnar side. Extensor aspect of arm and posterior aspect of leg and trunk, sensation normal. Pressure on ulnar nerves causes practically no pain.

¹ *Proceedings*, 1912, v, p. 149.

Case of Granuloma Annulare.

By E. G. GRAHAM LITTLE, M.D.

THE patient was a little girl, aged 9, the daughter of a medical man practising in British India. The eruption had commenced twelve months previously while resident in India, and at the present time there were numerous and characteristic lesions on the right medius and ring fingers, on the dorsum of the right foot, and a small efflorescence about the external malleolus of the same foot, and on the leg about the knee on both sides. In addition to the characteristic ringed lesions there were some small erythematous, not ringed patches the size of a threepenny-bit, on the legs of both sides. There was no tubercular history. The child looked pale and somewhat thin.

Case of Erythromelalgia.

By E. G. GRAHAM LITTLE, M.D.

THE patient was an elderly woman with an eruption of the hands and feet, which the exhibitor regarded as possibly of the same class as some cases which had been described as erythromelalgia. She had had for some two years a pronounced redness of the palms and soles accompanied by considerable tenderness and pain in these parts. The colour was a vivid pink, and extended over the whole palm and slightly on to the flexor surface of the wrist, in between the fingers and along their inner and outer surfaces nearly to the dorsal aspect, and covered the whole plantar surface of the feet. There had never been any exudation or exfoliation, and the symptoms had persisted unchanged during the five weeks that the patient had been under observation; she did not have any treatment, either local or general, and had not taken any drugs which could account for the symptoms. She appeared otherwise in fair health.

DISCUSSION.

The PRESIDENT said he hesitated to accept the exhibitor's diagnosis of erythromelalgia, as the symptoms were apparently neither very severe nor markedly paroxysmal. Those features existed in all the definite cases of the condition which he had seen. Of course, there might be border-line cases, of which this might be one. He was familiar with the eczematoid condition which persisted in the intervals of the erythromelalgic phenomena.

Dr. F. PARKES WEBER said he did not think the present case was like those usually classed under the term "erythromelalgia." One reason was that the affection here was localized to the *palms* of the hands and the *soles* of the feet. But he believed some cases owning an arsenical cause had been described as erythromelalgia, in which similar areas had been affected. Probably arsenic could be excluded in this case. A somewhat similar condition might follow the repeated use of salvarsan and neo-salvarsan, but not with this sharply limited distribution; in such cases there would be some accompanying general erythema and desquamation. During the "arsenical beer epidemic" there were several cases, he believed, in which a remarkable redness of hands and feet occurred.¹ One was reminded also of the erythematous condition of the *backs* of the hands and feet in pellagra.

Dr. MACLEOD said that he did not think the case was one of erythromelalgia. He had under his care at present a case of that disease in a young lady, but there the lesions were not symmetrical, and were associated with paroxysms of violent pain. He thought it possible that the affection was of toxic origin, the result of some form of auto-intoxication.

Case of Dermatitis Herpetiformis.

By E. G. GRAHAM LITTLE, M.D.

THE exhibitor had announced this as a case of "erythema iris of a persistent type." The patient when first seen had had a circinate erythematous and bullous eruption on the flexor surface of the wrists, which had perfectly simulated erythema iris, but the history given was that he had had a similar eruption all over the body from time to time during the past four years, with no longer interval of freedom than two months at any time in that period. Since his earlier visit he had

¹ In regard to toxic and toxæmic causes for cutaneous changes of somewhat similar distribution to that in the present case, one might instance the rare condition of gonorrhœal keratosis of the feet and hands.

developed quite another type of eruption—namely, grouped small vesicles—on the thighs and body, which was typical of dermatitis herpetiformis. There had never been excessive itching.

The case when first seen had strongly recalled the case of persistent erythema multiforme shown by the exhibitor to the Section on two occasions and at the International Congress. No very definite diagnosis had been made of this case, and the present experience made the exhibitor inclined to include that case under the category of dermatitis herpetiformis. Hallopeau had described and figured in the St. Louis Atlas (fascicule 10) a case of “dermatitis herpetiformis en cocarde,” which he expressly stated “bore a singular resemblance to herpes iris of Bateman.” He notes the rarity of this type of the affection which bears the name of Duhring. In his case also the subsequent eruption of lesions more characteristic of dermatitis herpetiformis cleared up all doubts as to its nature.

The exhibitor had at the present time in the wards of St. Mary's Hospital two twin brothers, marvellously alike in person, who had been for several years and were now the subjects of dermatitis herpetiformis. The facial, corporeal and nosological resemblance of these two young men, who were aged 20, was very singular.

Dr. A. EDDOWES considered the case confirmed the ideas that these cases of dermatitis herpetiformis frequently bore a close resemblance to erythema multiforme.

Psoriasis and Exfoliative Dermatitis lapsing into Dermatitis Herpetiformis (Duhring).

By H. C. SEMON, M.D.

THIS case, which had been referred to by the exhibitor at the last meeting of the Section, on February 19,¹ in connexion with Dr. Russell Wilkinson's case of dermatitis herpetiformis treated with salvarsan, was now convalescent, and presented neither vesicles nor bullæ, but only the remnants of partially pigmented and softly infiltrated erythematous plaques. The patient, a woman, aged 41, was admitted to the Great Northern Hospital on January 20, with a more or less generalized eruption of vesicles and bullæ, well-marked exfoliation of both palms and soles, and on the arms a few lesions of psoriasiform type covered

¹ *Proceedings*, p. 115.

with scales, which on removal exposed the oozing points of vascular papillæ. The upper part of the face and forehead were the only portions of the body free from lesions, and the scalp, ears, neck, trunk, and especially the legs, both anterior and posterior surfaces, were covered with vesicles and bullæ, varying in size from a pin's head to a pigeon's egg. Many of the blebs arose from an erythematous softly infiltrated base, especially the smaller ones; not a few, on the other hand, from apparently normal skin. Their contents consisted *ab initio* of clear or slightly blood-stained serum, and this was not under great tension, most of the larger bullæ being flaccid. A certain amount of crusting and secondary infection had taken place, and subjective symptoms of itching and burning, especially at night-time, were a marked feature of the case.

The eruption of the bullæ and vesicles continued from the day of admission (January 20) until about February 25, and was accompanied throughout by a septic type of temperature, which did not, however, exceed 101.6° F. The general condition of the patient, considering the severity of the symptoms, was at no time a cause for anxiety. On admission there was an eosinophilia of 27 per cent., and this had only slightly decreased to date to 24 per cent.

The interest of the case and the point which the exhibitor desired to place on record was the question of an ætiological versus a chance sequence in her highly suggestive history. For twelve years this patient had been an intermittent sufferer from psoriasis, for which she had been treated, amongst others, by the late Dr. Radcliffe Crocker, whose 1902 case-book confirmed her statement. For four months previous to admission Dr. de Boissier, of North London, had been treating her for the same condition, and was positive that he had given her no arsenic for two months. He mentioned, however, that the patient was highly emotional, and a secret alcoholic. The patient stated that whilst under this gentleman's care she had, unknown to him, made a trial of the "cuticura cure," and that a few days later she had developed intense inflammatory symptoms on the face, neck and arms, which culminated in peeling of the skin. A week later the blisters made their appearance (January 4), and on January 20 she was admitted in the condition which has been already described.

The character and grouping of the bullæ, the presence of the erythematous plaques, the eosinophilia, and the comparatively good health of the patient, in spite of many restless nights from the intense pruritic symptoms, were fairly conclusive evidence of the nature of her malady, but the ætiological significance, if any, in the direct

sequence of psoriasis, exfoliation and dermatitis herpetiformis had not, so far as the exhibitor knew, been noted hitherto, and was one on which he would much like to have heard the opinions of members of the Section.

Hydroa Æstivale (et Hiemale).

By H. C. SEMON, M.D.

THE exhibitor was of the opinion that this was a mild case of the condition first described by Bazin, in 1863, under the title, "Hydroa vacciniforme," and since classified by Hutchinson, Crocker, Bowen, Adamson and others as belonging to a distinct group of eruptions produced by actinic light rays of short wave length on exposed parts of the body. The patient, a boy, aged 8, had first developed small pimples on his cheeks, forehead and ears about a year ago. The eruption, which was always irritable, had later appeared on the backs of his hands and wrists, and in the course of the summer, when he was wearing socks instead of stockings, on his knees and legs. Many of the spots had discharged a clear fluid, and minute crusts had been noticed by the mother to form on the surface of these, and to fall off in the course of about a week or ten days. There was nothing in personal or family history of importance in the case, nor were the other children similarly affected. The patient had never been quite free of the eruption since its first appearance, although at the present time the hands and legs were free. In this respect it differed from the more common summer prurigo type of Hutchinson. The patient's face now presented irregularly scattered scratched papules, and these were situated mainly on the cheeks. On the sides of the nose were to be seen minute pitted scars, and a few of these were present among the papules on the face. On two occasions the exhibitor had satisfied himself that the primary lesion was a pale conical papule surmounted by a tiny vesicle, which doubtless accounted for the history of a clear discharge with crusting. A small nodule excised from the back of the hand exhibited perivascular round-celled infiltration in the vessels of the corium, and in the lower layers of the rete Malpighii.

Treatment of the condition by lotions and ointments of various kinds, whilst they alleviated its irritability and checked the tendency to the formation of impetiginous crusts, had in no way diminished the

eruption of fresh papules, and an ointment containing æsculin, a colourless substance derived from walnut juice, which is known to have a selective actinic absorptive action on ultra-violet rays, seemed also to be powerless in this respect.

The case is interesting, in that it would seem to belong to a class midway between the severe bullous eruptions described by Bazin and the mild summer prurigos of Hutchinson. It has been noticed by Linser that such cases are sometimes associated with hæmatoporphyrinuria, and this author reports a case in which he could produce an excess of this pigment in the urine at will by exposing the patient to the light of an arc lamp or the rays of a Röntgen tube. The brilliant researches of Hausmann, who, by injection of minute amounts of hæmatoporphyrin, succeeded in sensitizing white mice to the action of photo-actinic rays, also deserve mention in this connexion.

In Dr. Semon's case, the examination of the urine, both chemically and by the spectroscope, failed to reveal the presence of an excess of the pigment.

Dermatological Section.

April 16, 1914.

Dr. J. J. PRINGLE, President of the Section, in the Chair.

Case of Double Primary Chancres of the Lips and Neo-salvarsan Erythema Toxicum.

By GEORGE PERNET, M.D.

THE patient was a man, aged 27, who first came under observation on March 17, 1914, for an extensive rash over the body and limbs. He had two sores on the lips: one to the left side of the middle of the lower lip, and the other more or less corresponding on the upper lip. These had started five weeks previously. The rash followed four weeks later, and had been present a little over a week. The sore on the lower lip was the first to appear, and was very quickly followed by the one on the upper lip. Both were well defined, and more or less circular and definitely indurated. The lower one exhibited a whitish exudation on its surface, whilst the upper one was crusted anteriorly. There was submental adenitis, and there was a marked hard swelling about the left angle of the jaw, and also to a less extent about the right angle. There was also post-sternomastoid adenitis, but no inguinal adenitis. The genitalia showed no sign whatever of primary sore, but there was some secondary rash about them. No epitrochlear adenitis. The throat was ulcerated, especially on the left side. The rash was mainly roseolar on the trunk, and papular and papulo-squamous about the limbs and face. The palms were typically affected. No headaches.

As the patient was a source of danger to his wife and children, and as he had no headache, and was found after careful overhauling to be quite healthy otherwise, he was given 0.9 gm. of neo-salvarsan

intravenously on March 21. When seen again, on March 24, he said he had had some vomiting, diarrhoea and "stomach-ache." He also exhibited a characteristic erythema toxicum about the backs of the hands, on the insteps, and about the knees, which had started the day after the injection. This rash was circinate and punctate, and in parts coalescent. Faint remains could still be seen, especially on the knees. This rash was in the exhibitor's opinion quite independent of the syphilis, and was a toxic manifestation.

As a result of the neo-salvarsan, the primary sores had rapidly healed, the swellings at the angle of the jaw had subsided, and the rash had markedly faded, but remains could still be made out. The origin of the infection could not be traced, and appeared to be purely accidental. The exhibitor reminded members that he had shown a case of double primary chancre of the lips in a girl at the International Congress of Medicine last year.

DISCUSSION.

The PRESIDENT (Dr. J. J. Pringle) asked whether the patient had been known to smoke anyone else's pipe, or to have used a common pen and placed it in his mouth. His experience was that chancres of the lips were not very infrequently multiple. He inquired if the exhibitor had considered the toxæmic eruption as an example of Herxheimer's reaction, and invited the views of members as to the comparative frequency of the Herxheimer reaction after the administration of neo-salvarsan as compared with that after the original salvarsan.

Dr. GRAY asked what amount of fluid was used in giving the 0.9 gm. of neo-salvarsan in this case, seeing that the patient had abdominal symptoms and diarrhoea. He had noticed a considerable difference in this respect according as the injection was given in a very dilute or in a concentrated form. In the latter case one seldom saw after-effects, whereas every care as to the purity of the water did not seem to obviate such effects when given in dilute form. He understood the Herxheimer reaction to be an exaggeration of the ordinary lesions which existed for the time being, but in the present case there seemed to be an added eruption. He hardly ever saw the Herxheimer reaction, and he thought this was because he used big doses; it seemed to appear as a rule after small doses.

Dr. WHITFIELD said that he considered the Herxheimer reaction to be a specific reaction of syphilitic tissue as the result of treatment. It could be produced occasionally by mercury as well as by salvarsan. In this case the symptoms described by Dr. Pernet appeared to be a non-specific reaction,

due to the drug rather than an exacerbation of previously present syphilitic symptoms. The term "erythema toxicum" would therefore perhaps fit this particular case, though it was a rather wide and indefinite term, and he thought that "salvarsan erythema" would be better. The point which he wished to emphasize was that the Herxheimer reaction was specific for the disease and not for the drug. If the name "Herxheimer's reaction" was objected to, one might perhaps substitute "therapeutic reaction" for it.

Dr. F. PARKES WEBER asked whether the fauces were particularly involved in the general toxic erythema, which affected the skin; sometimes they were affected in an extreme degree.

Dr. MACCORMAC said he had not observed the Herxheimer reaction so often after neo-salvarsan as after the old salvarsan. But he saw the reaction too seldom to be able to form a reliable judgment.

Dr. PERNET replied that the patient used his own fountain pen, and he had not smoked strange pipes. Every inquiry had been made to settle the mode of infection, but without success. Sometimes one saw what the French called "chancres successifs." He thought the rash seen in this patient was better termed "erythema toxicum" than Herxheimer reaction. This rash he did not regard as a reaction of syphilitic tissue. As this patient had a bad specific throat, the exact condition of the fauces could not be made out.

Case of Bilateral Telangiectases (Nævus Araneus).

By W. KNOWSLEY SIBLEY, M.D.

THE patient is a single woman, aged 35, a tailor's presser by occupation, who states that her father died at the age of 48 from apoplexy, her mother at the age of 64 from bronchitis, and she has a sister at the present time in an asylum. Another sister suffers from a similar skin condition, but to a much less extent.

The patient states she had an attack similar to the present one six years ago, which lasted for about six months and then cleared up after applying some lotions. The present condition has been coming on for some seven months; the lesions first appeared on the sides of the lower jaw. There are now a large number of telangiectatic dilatations varying in size from a millimetre to a centimetre, scattered fairly symmetrically over the lower regions of the face, being especially abundant over the ramus of the jaw and sides of the neck, extending down for some centimetres over the upper regions of the chest and

on to the breasts. Minute ones are also present scattered about the surfaces of the arms.

The majority readily disappear on pressure; some, however, of the larger ones persist. The smallest lesions consist of minute red points, others are obvious vascular nævi, the so-called "tache de Morgan," and the larger ones reveal a stellate or loose network of fine vessels, radiating in many cases from a central lesion; these have been described as "spider nævi." On close examination there is a faint atrophic scarring in places, and many of the affected skin areas have all the typical appearances of old-standing radio-dermatitis with marked telangiectases, but the patient has never had X-rays applied.

On the buccal mucous membranes several very similar lesions are present, especially on the inside of the cheeks. The capillaries on the lower eyelids are also considerably dilated, making the whole eyes look red and congested, and to a lesser extent dilated vessels are present on the conjunctivæ and upper eyelids. The veins of the legs are markedly varicose, up to the inguinal regions. She has not suffered from hæmorrhoids, nor has she ever had epistaxis. She states that her catamenia are normal. The urine does not contain either albumin or sugar. The pulse is regular and about 80; the second aortic sound is distinctly sharp and accentuated. The patient states that, two years ago, she was in the infirmary for four and a half months suffering from gastric ulcer, at which time she had hæmatemesis, melæna, and hæmaturia. On palpation there is nothing obvious about the abdominal organs at the present time.

Many authorities have associated the presence of this form of telangiectasis with disease of the abdominal organs, often of a malignant nature. Fearnside¹ considers that telangiectasis in children is associated with wasting and protracted disease, and in adults with grave wasting and asthenic conditions. Osler² that spider nævi are met with on the face and other parts, especially in cirrhosis of the liver, cancer, and chronic jaundice from gall-stones.

Douglas Symmers,³ on the other hand, comes to the conclusion that these skin angiomas bear no relation to malignant disease, in which opinion Dubreuilh⁴ agrees.

¹ Fearnside, *Brit. Journ. Derm.*, 1912, xxiv, pp. 35-57.

² Osler, *Johns Hopkins Hosp. Bull.*, 1901, xii, p. 333.

³ Symmers, Douglas, *Med. News*, Philad., 1902, lxxxi, p. 1207.

⁴ Dubreuilh, Congrès (XIIIe) Internat. de Méd., Par., 1900, Compt. rend. (Sect. de Derm. et Syph.), 1901, p. 599.

As a student I was taught that the minute red nævi, "the taches de Morgan," were associated with malignant disease. Considering the very great frequency of a few of these taches on many people, I do not think there is any connexion between these conditions, unless they are present in large numbers, when there might appear to be some relationship.

The symmetrical areas of telangiectases which occur over the malar processes in cases of chronic mitral disease are well recognized and do not appear to have any connexion with the condition under consideration, being always limited to these areas, and not occurring as distinct nævoid patches.

DISCUSSION.

The PRESIDENT, who was sceptical on the point, could not, after close interrogation, upset the patient's definite statement that the eruption had completely disappeared and recurred. Her appearance suggested to him some profound toxæmia.

Dr. ADAMSON said the same woman had been shown by him at a meeting of the Section five years ago,¹ and the condition did not seem to have altered in the interval, though the patient looked more ill and thinner. Her statement that the patches had gone away and come back again he attributed to inaccurate observation on her part, for he had seen her off and on for two years, during which time there had been no change. A photograph published in *St. Bartholomew's Hospital Reports* in 1909² showed exactly the same condition as at present, except that a few of the larger patches had been destroyed by electrolysis. An interesting point in regard to these cases of multiple telangiectases was whether we were to regard them as nævoid conditions or as alterations due to some acquired illness. Hyde had published some cases in the *British Journal of Dermatology*³ in which the telangiectases were associated with exophthalmic goitre, and when he (the speaker) first saw this patient he thought he could detect some enlargement of the right side of the thyroid and some slight exophthalmos, but neither of these conditions could be said to be present now. Everyone would recall the family groups of cases of multiple telangiectasis published by Osler and by Parkes Weber. In these cases there had been hæmorrhages from the mucous membranes, and especially epistaxis. One must hesitate to place the case, now before the Section, into the Osler and Parkes Weber group on account of the absence of family history, though the recent mucous membrane hæmorrhages perhaps brought it nearer to that category. On the whole, Dr. Sibley's original diagnosis of "spider nævus" seemed better to express the ætiology of the complaint than did the term

¹ *Proceedings*, 1909, ii, p. 128.

² *St. Bart. Hosp. Rep.* (1909), 1910, xlv, p. 16 (Plate II).

³ *Brit. Journ. Derm.*, 1908, xx, p. 33.

"multiple telangiectases," which was merely descriptive. A point which favoured the view that, in this case, the telangiectases were nævoid in character was the fact that the larger vascular patch on the front of the chest had been there as long as she could remember.¹

Sir MALCOLM MORRIS, K.C.V.O., said he had seen cases in which spider nævi disappeared from the face spontaneously. He had watched, over a long period of years, the case of a lady who had spider nævi, which came out in crops. He had no explanation to offer for this, but there seemed to be an idea that they were due to exposure during hunting. If such a condition could disappear from the face without any treatment, he did not see why it should not occur in any other part.

Dr. DUDLEY CORBETT said he had seen spider nævi come out during pregnancy, and almost entirely disappear when the pregnancy terminated.

Dr. F. PARKES WEBER said that probably the least uncommon kind of spider angiomas to disappear was that met with in young children, which might disappear when they grew up. But other typical spider angiomas might also come and go. Some were associated with liver disease and jaundice, and if these latter cleared up the angiomas might disappear also. Sir Dyce Duckworth had, he believed, observed illustrative cases of that kind. The case now shown by Dr. Sibley he regarded as belonging to the category to which Sir William Osler first drew general attention under the heading, "A Family Form of Recurring Epistaxis associated with Multiple Telangiectasis of the Skin and Mucous Membranes" (*Johns Hopkins Hospital Bulletin*, Baltimore, November, 1901, xii, p. 333). Dr. Weber's family group of cases was described under the heading, "Multiple Hereditary Developmental Angiomas," in the *Lancet*, London, 1907, ii, p. 160. The epistaxis was doubtless much less of a feature in some cases. From Sir William Osler onwards, all observers of these remarkable cases agreed that they bore no relationship with cancer, either of the abdomen or elsewhere; and it was somewhat confusing to have that idea brought forward now. Another kind of tiny multiple angiomas often developed on the trunks of old and degenerate people, and might therefore occasionally be associated with the onset of visceral carcinoma. Typical spider angiomas and hair-like branching telangiectases of the skin of the face were not rarely associated with the bleeding multiple telangiectases of Osler's group. In regard to the term "spider nævus" or "nævus araneus," he (Dr. Weber) thought that, as the condition was often not congenital, the term "spider angioma" or "spider telangiectasis" was preferable. The condition might indeed develop relatively late in life, as in some patients with hepatic cirrhosis, &c.

Dr. MACCORMAC said that when he was Registrar at Middlesex Hospital Dr. Pasteur had a patient under his care with exophthalmic goitre who had

¹ A very complete summary of our knowledge of "multiple telangiectasis" is given in a paper by Dr. Colcott Fox in the *British Journal of Dermatology*, May, 1908, xx, pp. 145-62.

a crop of spider *nævi* over the body. They completely disappeared before she left the hospital. She had had a similar skin condition when suffering from gastric ulcer, four years previously. The skin had been quite free from these spider *nævi* in the interval between the two diseases; clearly, therefore, it was possible for them to disappear completely.

Dr. WHITFIELD said he was in agreement with Dr. Adamson. He considered that the term "spider *nævus*" should be reserved for an angioma that was a *nævus*—i.e., a congenital angioma, and one that looked like a spider. He had the idea that these telangiectases were in all probability late developing-congenital abnormalities, and therefore fell properly under the head of *nævus*, just as moles did. He had at the present time under his care a girl past the onset of puberty in whom soft moles were developing at an alarming rate. There was also another class of telangiectases which were acquired and were not *nævi*. This type, he believed, were minute aneurysms either from diseased walls as in angio-sclerosis, and to this type he believed the telangiectasis of cancer and cirrhosis belonged, or they might be traumatic aneurysms produced by partial rupture of a small arteriole due to violence or the bites of insects. This produced a bulging of the wall, and so the blood was transmitted at higher pressure to the capillaries, which in their turn dilated. He had watched such a condition appear on his own thumb after dropping something heavy on it. These aneurysmal telangiectases occasionally disappeared, and when they did so he thought it was due to clotting in the vessel and fibrosis of the affected area. In this particular case Dr. Adamson remembered and had a photograph of the old lesions, and they were in the same position now as when the case was under his care. That seemed fairly good evidence that the history was erroneous, and he would point out that one of these angiomata had been present as long as the patient could remember. As regards the use of the term "*nævus*" to signify only a congenital growth, he thought this was now fairly universal among English dermatologists, and it had been so used for many years by the German school.

Dr. GRAY said he understood that some cases of the same kind had been recorded in association with cirrhosis of the liver. Dr. Galloway published a marked example of stellate *nævus* associated with cirrhosis of the liver. The present patient appeared to be going downhill; she had wasting and marked gastric disturbance, especially in the early morning, and there was a history of hæmorrhage from the stomach.

Dr. MACLEOD thought the condition was *nævoid*, and of congenital origin. He considered it an advantage to limit the term "*nævus*" to the congenital anomalies. He did not think that it was possible, from the appearance of the lesions alone, to decide whether they were of congenital origin or acquired.

Dr. KNOWSLEY SIBLEY, in reply, said he thought the condition should be called one of telangiectasis, the term "*nævus*" being retained for conditions which were present at or shortly after birth. The present condition could not

be called congenital, it having come on at about thirty years of age. The patient was believed to have had a gastric ulcer, and she still suffered somewhat from dyspepsia, but he could not detect any change in the liver, or any other signs of abdominal disease. Apparently her present condition did not greatly differ, either locally or generally, from that six years ago, except that the lesions about the face and neck were not now so numerous.

Case of Purpura.

By W. KNOWSLEY SIBLEY, M.D.

THE patient is a healthy woman, aged 27, a widow, who has never had a serious illness nor rheumatism. Thirteen weeks ago what she described as blotches appeared first on her right arm in crops which fade and leave a bruise; a moderate-sized furunculus is present on the left breast, which is painful. She has considerable pyorrhœa alveolaris. Scattered over various parts of the body, especially marked over the posterior axillary folds, where they appear in more or less parallel lines, looking like scratch marks, are numerous small subcutaneous hæmorrhages of a purpuric nature; smaller ones are also present on the thighs. On the mucous membrane of the lower lip are remains of recent hæmorrhages, which are also present on the palate. The patient states that her gums bleed considerably during her menstruation, and often also her nose at these times. Her catamenia, which commenced at the age of 13, are usually regular and normal, but the last three periods have been severe, the last one continuing for a week.

The PRESIDENT said the case was clearly a purpuric condition, and its curious distribution in striæ almost suggested a traumatic origin.

Case of Persistent Erythema of an Erythromelalgic Type.

By G. NORMAN MEACHEN, M.D.

THE patient was a girl, aged 15, who had been sent to the exhibitor by a medical colleague at the Prince of Wales's Hospital as suffering from erythema nodosum. For the last two and a half years she was said to have had pain in the legs, relieved by assuming the horizontal position, and the shins were of a purplish-red colour. There was no

history of actual joint pains, but eighteen months ago she had pains in her arms "like rheumatism." On examination the shins and calves of both legs were of a deep red colour, and they appeared somewhat tense. The upper and lower margins of these erythematous areas faded gradually into normal skin, and the feet were unaffected. There was no œdema. No nodose lesions of any kind were present. The hands were in a condition of erythema perstans. The fingers had never become "dead." The heart was normal. A blood count, kindly made by Dr. McDonald, gave the following results: Hæmoglobin, 75 per cent.; red cells, 3,296,000; white cells, 7,600; small lymphocytes, 28 per cent.; large lymphocytes and transitionals, 7 per cent.; polymorphonuclears, 60 per cent.; eosinophiles, 3 per cent.; mast cells, 2 per cent.; no poikilocytosis; slight anisochromia. The blood coagulation time was seven and a quarter minutes. Though presenting some of the features of erythromelalgia, the condition was not wholly typical of that affection.

DISCUSSION.

Dr. F. PARKES WEBER said he believed that what was called "Bazin's disease"—"erythema induratum"—was made up of two constituent factors: one was the actual erythema induratum, and the other was a kind of erythema perstans. He considered that the present patient had an erythema perstans of the legs of the type met with in Bazin's disease, so that one would not be surprised if she, later on, were to develop typical Bazin's disease, though she had not done so as yet. He did not think that the erythema perstans associated with Bazin's disease need necessarily be of the "livedo annularis" type ("livedo reticulata").

Dr. ADAMSON said the point mentioned by Dr. Weber had occurred to him. Was this a case of early Bazin's disease? He came to the conclusion that it was not, because here there was a dusky diffuse erythema or cyanosis. In Bazin's disease the erythema was more of the reticular or livedo annularis type, and not the diffuse form.

Dr. WHITFIELD said that he was of opinion that the cyanosis accompanying Bazin's disease was not so characteristic that one could attempt to diagnose it in the absence of the nodules. One saw all kinds of cases of fairly marked chilblain circulation, but he would not expect that such cases were going to develop erythema induratum, because, unless the patient had tubercle, he would not have true Bazin's disease. The condition in this case resembled what the older authors used to call erythema leve, and it was commonly associated with mitral disease and œdema. That was, of course, not so in this

case. The patient had, however, a highly abnormal blood ; if the number of red corpuscles was translated into percentage to compare with the hæmoglobin it would be found that there was 75 per cent. hæmoglobin and 71 per cent. red corpuscles—i.e., a colour index of slightly more than 1, and this was a very unusual count for ordinary chlorosis. The girl had also 2 per cent. mast cells and 3 per cent. eosinophiles, both of which figures were unusual in ordinary blood counts. The mother said that the catamenia had not yet begun, though the girl was aged over 15. Lastly, he said he was sorry that Dr. Meachen had not stated what method had been used in estimating the blood coagulation time. If this was done at blood-heat, as was almost universally the case now, seven and three-quarter minutes was astonishingly long.

The PRESIDENT said his general appreciation of the case coincided with that expressed by Dr. Whitfield. He remembered to have seen two similar cases, which passed off after the establishment of the catamenia, although previously of long duration and resistant to treatment.

Dermatological Section.

May 21, 1914.

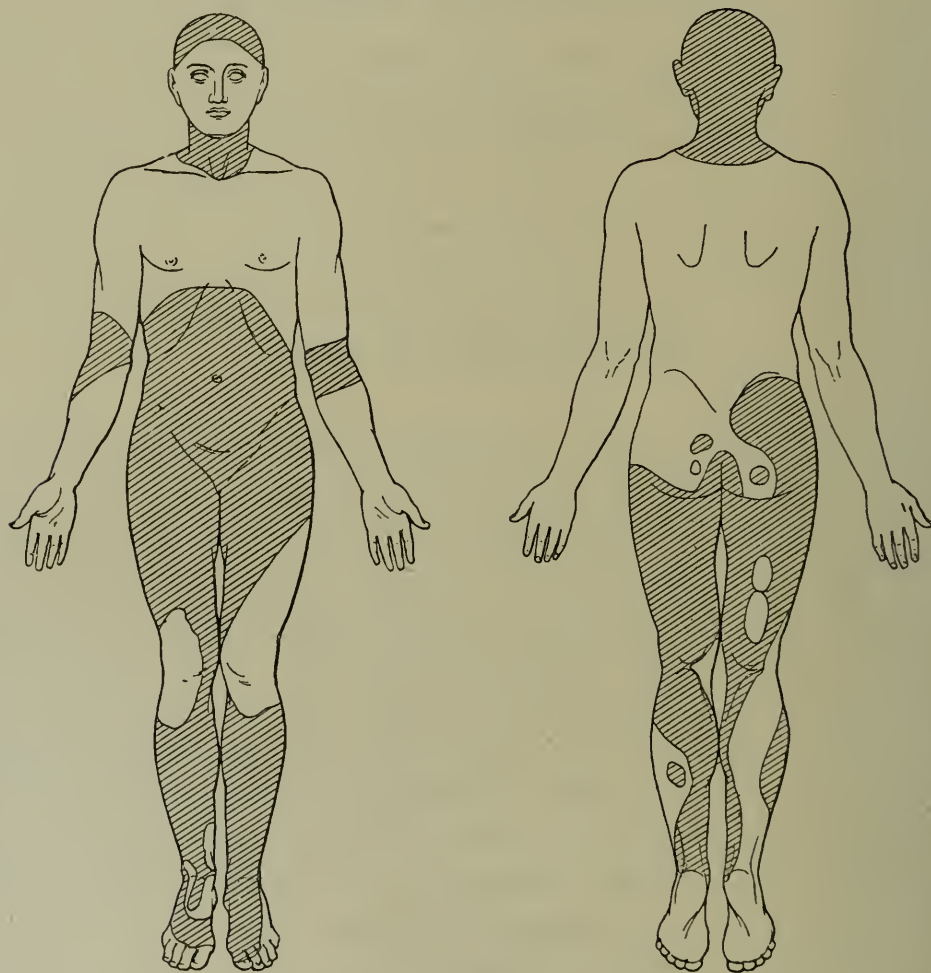
Dr. J. J. PRINGLE, President of the Section, in the Chair.

Demonstration of Cases.

(1) THE PRESIDENT (Dr. J. J. Pringle) showed (1) a case of mycosis fungoides in a man, aged 64, known to many members of the Section, in whom the disease probably began in 1896. He came under the exhibitor's observation in 1899 for mycosic tumours on the face. He had previously suffered from severe syphilis, and had been under treatment for it. He still had hyperkeratosis of the right palm, possibly of syphilitic origin, but the Wassermann reaction was consistently negative. The tumours of the face were removed by Mr. Jonathan Hutchinson, jun., about 1900. Infiltrated erythematous patches and flat tumours had appeared all over the trunk and limbs since that time, but had always been readily "dispersed" by X-rays. The condition had latterly been kept in abeyance by the arc lamp. There had never been any tangible involvement of lymphatics. There was no constant abnormality in the blood count. Only on the face had there been definite "tumour" formation. The control exercised over the disease by X-rays and light treatment was very remarkable. There was no defect in the patient's general health which could be referred to his skin disease, nor to the prolonged series of exposures to X-rays.

(2) A typical and extensive case of "parapsoriasis en plaques" in a lad, aged 20, by occupation a gardener, the disease having begun in July, 1913. It was first noticed as a red patch about the size of a shilling on the inner side of the left thigh. Soon afterwards a patch

appeared on dorsum of left foot. The neck and face were next attacked, and the scalp became involved (no previous scurfiness). The plaque on the abdomen appeared independently, and had slowly spread to coalesce with those on thighs. The margins of all plaques were sharply demarcated. Itching all along had been moderate. He had not been X-rayed. Considerable improvement had occurred during treatment by



Extensive parapsoriasis en plaques.

rest and mild sulphur, resorcin, and salicylic ointments. The case was shown mainly to illustrate a condition formerly usually considered to be pre-mycotic. The involvement of the face and scalp was unusual, and the case presented an undoubted seborrhœic element which suggested to some Fellows the diagnosis of a seborrhœic dermatitis.

(II) Dr. SEQUEIRA showed a woman, aged 52, suffering from leprosy. She was born in Odessa and came to London eight years ago. The case was shown at the Royal Society of Medicine on October 16, 1913.¹ The case was interesting in connexion with the differential diagnosis of leprosy and mycosis fungoides. The diagnosis had been confirmed by microscopical examination.

(III) Dr. S. E. DORE showed a man, aged 63, who presented a patchy erythematous eruption of dubious nature on the trunk and limbs. It consisted of ill-defined brownish-red patches of irregular shape and outline, and varying in size from a sixpenny-piece to the palm of the hand. Some of the lesions showed a tendency to central evolution, others were slightly raised above the surface and gave the feeling of distinct infiltration. There was no appreciable scaling and no itching, but even soothing applications such as calamine or lead lotion caused reddening and burning of the affected skin. The first patch was noticed on the abdomen two and a half years previously, and this was followed about six months later by similar but smaller patches scattered over the chest, back, arms and legs. With the exception of a small recent patch on the right elbow the eruption had persisted and remained almost stationary since that time. The patient had been a shipwright and had visited, but not resided in, Calcutta; he had suffered from dyspepsia for the past seven years and during the same period he had complained of excessive sweating all over the body. He was now under the care of Dr. Kinnier Wilson for chronic gastritis. There was no anæsthesia of the patches or thickening of the ulnar nerves. The diagnosis suggested by the exhibitor was "parapsoriasis en plaques," an alternative diagnosis being that of the early stage of mycosis fungoides, although the entire absence of itching was against the latter.

¹ *Brit. Journ. Derm.*, 1913, xxv, p. 365.

Discussion on Mycosis Fungoides.

Opened by J. H. SEQUEIRA, M.D.

I ESTEEM it a great honour to be invited to open a discussion on a disease of such intense interest to dermatologists as mycosis fungoides. It is especially gratifying to me to do so during Dr. Pringle's presidency of the Section, for I owe to him the opportunity of studying two remarkable cases of the disease which he was kind enough to place under my care for long periods. I do not hope in the course of this communication to add anything to the common stock of knowledge, but I trust that the limited survey which the time at my disposal permits will lead to a discussion which will be of service in elucidating opinions on certain debatable points.

HISTORICAL.

The early history of the disease is best studied in the Besnier-Doyon edition of Kaposi's work, and the salient points are, I imagine, so well known that I need only touch on them briefly.

In 1812 Alibert called attention to the disease, which he called "pian fungoide," believing the condition to be a form of yaws. The patient was a Parisian, and the case is figured in Alibert's atlas. In the later editions of his work (1835) Alibert applied the name "mycosis fungoides" to the disease, the name being used to describe the mushroom-like appearance of the tumours. There was no intention of suggesting that the disease was due to fungi. In 1851 an admirable account of the clinical features of the disease was given by Bazin. For some years the centre of interest lay in the French school, but in 1864 Köbner published an important communication in which he described the disease as a "granuloma." We then come to the stage in which the study of histology made its influence felt, and we have contributions by Ranvier (1869) and Hebra (1872).

If we now turn to the English school of dermatology, we find the disease described by Erasmus Wilson in 1874 as "eczema tuberculatum," and in the same year by Tilbury Fox as "fibroma fungoides." Mycosis fungoides received attention at the Medical Congress in London in 1881. In 1883 Dr. George Thin showed a case at the old Derma-

tological Society, which he called "psoriasis hypertrophicus." The patient had been under the care of Mr. Waren Tay. Sections from this case were examined by Dr. Whitfield in 1900, and he decided that the condition was mycosis fungoides. Other early cases seen at the Dermatological Society of London were shown by Dr. S. Mackenzie (July 14, 1886) and by Dr. Pringle (February 9, 1887). The last case was discussed at the Paris Congress. In 1886 Dr. Payne published a valuable paper with coloured plates and bibliography.

Auspitz first used the name "granuloma fungoides," which many writers have since adopted. The relationship of the disease to leukæmic and pseudo-leukæmic conditions received much attention from Vidal, Paltauf and others, and later in Nékám's contribution on the leukæmic affections of the skin. Collections of cases and useful papers thereon have been contributed by Stowers, Hyde and Montgomery, Stelwagon, Johnston, Herxheimer, and others.

I need not dwell longer upon the history of mycosis fungoides, but proceed to summarize the views held by different authorities as to the nature of the disease. It has been variously believed to be (1) a granuloma (Köbner); (2) a cutaneous form of lymphadenoma—"lymphadénie cutanée" (Vidal); (3) a lymphosarcoma (Paltauf); (4) a malignant growth of connective tissue, a sarcoma, engrafted on psoriasis and eczema (Kaposi); (5) a bacterial infection, acting directly or through toxins; (6) the last term of a series of dermatoses, which includes pityriasis rosea and the parapsoriasis (Brocq).

ÆTIOLOGY.

Sex and Age.—To determine the sex- and age-incidence I have examined the data in sixty-one cases in the literature and have added my own thirteen cases (three already published by me). The figures are as follows: Of the seventy-four cases, forty-six were males and twenty-eight females. The ages varied in the males between 21 (Stowers) and 75, and in the females between 15 (Gastou and Sabaréanu) and 65. The incidence in decennia is as follows:—

					Males	Females
Over 70	...	...	...	...	3	0
Between 60 and 69	...	...	...	...	7	4
,, 50 and 59	...	...	...	...	12	7
,, 40 and 49	...	...	...	...	15	6
,, 30 and 39	...	...	...	...	5	5
,, 20 and 29	...	...	...	...	4	3
Under 20	...	...	...	...	0	3
					46	28

The three youngest patients were all females, respectively 15 (Gastou and Sabaréanu), 16 (Sereni) and 17 years old (Vollmer). Sereni's case was one of mycosis d'emblée, and it proved fatal in two and a half years.

Family-incidence.—Tilden mentions two cases in one family. I can find no other instance in the literature.

Race.—The disease appears to occur in all races. It has been observed rarely in the Negro (Strobel and Hagen). I have not seen a case among the Polish population in the East End of London. This point is of interest, for nearly all the cases of multiple idiopathic pigment sarcoma seen in this country have been in Poles.

Social Position of the Patient.—It is remarkable that of my thirteen cases seven have been seen in private practice, and two others were above the usual hospital class. I do not know whether this experience is in accord with that of other observers in this country.

Longevity of Parents.—Dr. Pernet has called attention to the fact that patients suffering from mycosis fungoides usually have long-lived parents, and as a rule they are in quite good health when they are attacked with the disease.

Syphilis is mentioned in several case histories, but does not appear sufficiently often to appear of any ætiological significance. There are many cases on record in which the disease was definitely excluded.

INJURY.

Riecke recorded a case in a man, aged 53, in whom mycosis fungoides d'emblée followed an injury. Radcliffe Crocker reported a case in which a kick on the knee was followed by prolonged suppuration in the head of the tibia, with lymphangitis as a sequel. A year later mycosis developed.

HISTO-PATHOLOGY.

Much attention has been paid to the histology of mycosis fungoides since the time of Ranvier, and many important papers have appeared on the subject. In this country the most instructive contributions of recent date have been by Galloway and MacLeod, and in Edinburgh by Jamieson and Huie, and their papers form the basis of this part of my communication.

In the *erythrodermic* stage the site of the affection is the upper third of the corium. The normal tissue may be entirely replaced by

the granuloma, which may extend in patches into the deeper parts of the corium. The situation suggests, as Miss Huie has pointed out, that the growth begins in a sub-papillary plexus of blood-vessels, and spreads upwards and downwards. The hair-bulbs are invaded, and hairs are usually absent from the sections. The sebaceous glands and sweat glands are surrounded by the cellular infiltration. The vessels are dilated, and in some instances thickened by proliferation of the endothelium.

Considering the lesions in detail, it is noted that the epidermis is secondarily affected, the corneous layer being thinned. The stratum granulosum is also thinned and may be wanting. The prickle cell layer and the deeper layers are œdematous, and the rete Malpighii is invaded by cells of the new growth. The granuloma is formed of cells of many varieties, lying in a delicate reticulum. These cells are thus classified by Miss Huie:—

(A) Cells of the fixed connective tissue type — the structural elements of the granuloma. Those are divisible into: (1) Cells with very large oval nuclei, containing little nucleoplasm, but a wide-meshed intranuclear nucleoplasm, and one to three large nucleoli. The faintly staining cell-plasm is drawn out into fine threads, which lose themselves in the intercellular tracery of the granuloma. (2) Smaller cells resembling (1) structurally. These are called the “daughter cells” by Galloway and MacLeod, and the “characteristic cells” by Leith. (3) Cells with nuclei as large as those of variety (1), but with a much denser reticulum, and more compact and more deeply staining cell-plasm. These cells are often seen in the act of mitotic division. Intermediate cells are seen, many of them with their nuclei being lobed in a peculiar manner. Giant cells with eight or ten nuclei more closely resembling the giant cells of syphilis than tubercle also occur.

(B) Round cells with deeply staining nuclei, and very little cell-plasm—some slightly larger than a red corpuscle, but most of them indistinguishable from lymphocytes. These cells appear to be most numerous where the granuloma borders on the prickle cell layer, and about the blood-vessels. Mast cells are not numerous. Plasma cells are rare. Polynuclear leucocytes are present in some areas. The endothelial cells of the blood-vessels undergo proliferation.

In the *tumour* stage the granuloma consists of: (1) Large oval cells containing a granular protoplasm and a single nucleus. (2) Numerous small cells slightly larger than a leucocyte with nuclei similar to those of type (1). These Galloway and MacLeod regard as

“daughter cells” of group (1). Leith, as already mentioned, considered them the “characteristic” cells of the growth, and this view is shared among others by Herxheimer and Hübner, who style these small mononuclear cells “mycotic” cells, characteristic of the morbid process. (3) Mast cells with basophile granules lying around the blood-vessels. (4) Plasma cells with a single nucleus and densely staining border. Endarteritis of the blood-vessels is present, and the connective tissue is hyaline.

In lymphatic glands, from an advanced case, Miss Huie found “astonishing multitudes” of plasma cells, and the lymph sinuses were crowded with rarefied, much vacuolated cells of the same type.

One practical point emerges from the consideration of the histology of the lesions, and that is: Can we by a biopsy in the pre-tumour stage make a diagnosis of mycosis fungoides before we are able to determine the nature of the disease on purely clinical grounds?

BACTERIOLOGY.

No one has yet demonstrated an organism peculiar to mycosis fungoides. The records of bacteriological observations are meagre. Stelwagon and Hatch report the presence of Gram-positive cocci; McVail, Murray and Atkinson described a “short, white bacillus”; Eyre found in Galloway and MacLeod’s case sarcinæ and the bacillus of Friedländer, all of which he believed to be contaminations.

THE CLINICAL FEATURES OF MYCOSIS FUNGOIDES.

The onset of mycosis fungoides is insidious. There is, as a rule, nothing in the condition to suggest the initial stage of a grave and commonly fatal malady. I think we may clearly distinguish three forms of pre-tumour manifestation:—

(1) *Onset with Pruritus*.—The patient complains of an intolerable and persistent itching, which is unaccompanied by any obvious change in the integument. One of my patients stated that he had been troubled in this way for five or six years. The pruritus usually lasts for several months to several years.

(2) *Onset with a Polymorphic Eruption*.—In this variety we meet with: (a) Macules or plaques of a red or purplish colour. Sometimes bullæ appear on these lesions. The plaques are often urticarial in type. (b) Patches of irregular outline suggesting dry eczema or seborrhœic dermatitis. These patches are usually slightly raised above the level of

the surrounding tissues. They are ill defined, and of a purplish, or sometimes yellowish tinge. The surface of these lesions may be: (i) Scaly, resembling psoriasis or the scaly seborrhoide; (ii) lichenoid, resembling lichen planus; (iii) oozing, resembling an eczema; (iv) covered with dry crusts. In rare cases the lesions in this stage are pustular: The trunk may be widely involved, the face may be affected, and, where there is infiltration, a leonine appearance suggesting nodular leprosy may be produced. Following these lesions, or coincident with them, there are often infiltrated plaques of a peculiar brick-red colour; the surface of the plaques may be finely mammillated like the rind of an orange, or there may be the characteristic tumours.

(3) *Onset with Erythrodermia.*—The erythrodermia may be the first manifestation of the disease, or it may follow one of the stages previously described. The lesions are red or violet plaques chiefly in the flexures. The surface is dry, and there may be a development of fine scales. The eruption may spread until it is practically universal. The patients are then in the condition known as “homme rouge.” The hair falls out over the affected parts, and the nails may be involved. The skin becomes œdematous, and there is enlargement of the lymphatic glands. In extreme cases the lips and even the buccal mucosa are involved, the lesions being white patches and superficial ulcers. In one of my cases feeding of the patient was very difficult. After a variable time nodules and tumours appear. In rare cases death has taken place without the appearance of the characteristic tumours.

Tumour Stage.—There is great variation in the time at which the tumours develop. For instance, in a case of Dubreuilh's there were a few weeping crusted areas upon which fungating and vegetating papules developed. There was no proper pre-mycotic stage, and urticaria developed some months after the tumours. In one of my cases the patient complained of pruritus only for several years before the tumours developed. In other cases we find tumours developing *pari passu* with the infiltrated plaques. In the rare type of “mycosis fungoides d'emblée” the growths are the first signs of the disease. The tumour stage usually begins as an infiltrated plaque of variable size, of a brick-red colour, with a mammillated surface, or as a rounded mass. The mycotic tumour varies in size from a cherry to half an orange. It usually develops on one of the primary lesions, but it may start in apparently healthy skin. The tumours are soft, of a dull red colour, hemispherical or nodular on the surface. They are often constricted about the base. There may be lesions of crescentic or semicircular form. The tumours

extend peripherally, and may ulcerate, or more rarely become gangrenous. A remarkable feature is the spontaneous disappearance of even large tumours without the formation of a scar or pigmentation. The tumours are found on the trunk, the upper parts of the limbs, the face and scalp (rarely). The glands are usually enlarged, but not always. Alopecia of the affected parts is usual, and it is curious that Giovanni relates a case in a woman, aged 26, in which a universal alopecia areata preceded the outbreak of mycosis fungoides.

A Primary Lesion.—Attention has been called to the frequent history of a primary lesion or “herald” patch, as in pityriasis rosea. In five of my cases this was noticed, the regions being the leg, arm, buttock, back (twice). Other regions noted are: forearm (Stowers), leg (Breakey), external malleolus (Ullmann), thigh (Towle), abdominal wall (Crocker), eyelid (Dubreuilh), &c.

Previous Dermatoses.—Kaposi believed mycosis fungoides to be a malignant process engrafted on some previous chronic skin affection—e.g., psoriasis, seborrhoides, &c. From time to time we find histories of such an occurrence reported by skilled observers (Radcliffe Crocker, Howard Fox, and others). I believe that such cases are rare and that what is often taken for a dermatosis of common type is really the pre-mycotic eruption which often closely simulates the psoriasis, eczema, or lichen. In two of my cases I had to revise diagnoses respectively of “lichen” and “seborrhoide” before the tumour stage, because the presumed simple eruption ran an unusual course.

Lesions of the Mucous Membranes.—Hallopeau and Weil reported affections of the tongue and of the buccal and pharyngeal mucous membranes. The lesions were white patches and superficial ulcers. I have a similar case now under observation in which the patient is unable to take solid food on account of the pain in the buccal cavity and tongue. Hallopeau and Jeanselme described a case in which progressive gangrene involved the palate. In Breakey’s case there were deposits in the tongue and tonsil, as well as in the viscera.

Rarer Symptoms.—Symptoms possibly due to metastases have been reported by Brandweiner (hemiplegia), anasarca (Lenoble), epileptiform seizures (Pringle), hæmophilia (Quinquaud). I have had a case in which dullness and a pleuritic friction were probably caused by a pulmonary growth.

BLOOD EXAMINATION.

It is difficult to compare some of the earlier blood counts with those of recent years, because the observers group different types of cells together. The following facts are culled from ten blood counts, four from my own cases: Polymorphonuclears, 53 to 83 per cent., average 69 per cent.; nuclear cells—large lymphocytes, 5 to 11.5 per cent., average 7 per cent., small lymphocytes, 6.5 to 14.5 per cent., average 10.7 per cent.; eosinophiles, 0 to 12 per cent., average 5.6 per cent.; basophiles, 0 to 1 per cent. Large hyaline cells were noted in three of my cases, respectively 2.5, 3.5 and 8 per cent. Lenoble reports 0.5 per cent. mast cells, and 0.5 per cent. myelocytes. In my cases the leucocytes averaged about 9,500 per cubic millimetre. There are several higher counts—viz., Hallopeau and Weil's case 12,500, Dr. Abraham's case 13,000, one of Dr. Jamieson's cases 13,000, and Giovanni's case 15,400. In many instances it is recorded that there was nothing abnormal in the blood.

It may, I think, be stated that there are no characteristic changes in the blood, and that cases in which a high leucocytic content has been observed belong to another group of affections—e.g., Ramazotti's case, in which the white cells numbered 106,000, mostly lymphocytes.

METASTASES.

In many records of autopsies, it is specially noted that there were no metastases. Kaposi reported one case in which there were metastases in the internal organs. I have recently seen a characteristic case in consultation with Dr. Nixon Groves and Dr. Ironside Bruce in which there was evidence of involvement of the right lung. In Lenoble's case there was a mycosic nodule in the right lung. Breakey reports a case in which there were nodular masses the size of a hazel-nut in the grey and white matter of both cerebral hemispheres, in the right lung, tongue, tonsil, and cervical, axillary, cubital and inguinal glands. Pye-Smith recorded a metastatic nodule in the left adrenal, and Paltauf one in the bladder. Riecke reported metastases in the dura mater, kidneys and retroperitoneal glands. Malherbe and Monnier found tumours in the lungs, heart, kidneys, uterus, both ovaries, and pancreas. Brandweiner's patient had symptoms of hemiplegia from a secondary deposit in the brain. In several autopsies congestion and ulceration have been found in the intestines.

THE INFLUENCE OF INTERCURRENT DISEASE.

In several instances the disappearance of the tumours has followed intercurrent disease. In Alibert's case an attack of erysipelas caused the disappearance of the mycotic tumours. Bazin also records a case, though Funk believed that the condition was really multiple idiopathic sarcoma. Allan Jamieson, however, records the case of a female patient who had two attacks of erysipelas, which had no influence on the disease. In one of Pringle's cases the tumours disappeared in the course of a fatal attack of pneumonia. In a case reported by Galloway and MacLeod temporary improvement coincided with an attack of influenza.

DURATION OF THE DISEASE.

The case of longest duration I have found in the literature is that described by Dr. Stopford Taylor, thirty-five years. Several are described as lasting for twenty years or more, and we must all have seen patients who have dragged on a miserable existence for five to twelve years. In some of the d'emblée cases, on the other hand, the duration has been a matter of months only.

THE CAUSE OF DEATH.

I ask for information as to the cause of death in mycosis fungoides. In my only case which came to an autopsy, death was sudden and due to pulmonary embolism. White and Burns record a case of death from septicæmia due, they believed, to X-ray treatment. Metastases may cause a fatal issue, but in most cases there is a gradual asthenia with intercurrent diarrhœa.

DIAGNOSIS.

In the tumour stage there is little risk of error, when the disease is borne in mind. Syphilis, yaws and leprosy are the affections for which mycosis is commonly mistaken, but the history of the case, and especially the intense pruritus which is so prominent a feature, should usually prevent error.

In the pre-tumour stage there is the greatest difficulty. We are confronted with a large variety of lesions resembling very closely several common dermatoses: psoriasis, parapsoriasis, lichen planus, eczema, the seborrhoides, urticaria, and the erythemata.

As Besnier said: "In all cases of ambiguous pruritic dermatosis which are prolonged and rebellious to treatment, the possibility of the disease in question being the pre-mycotic stage of mycosis fungoides should be borne in mind." I believe that with experience one can frequently make the diagnosis on clinical grounds alone quite early. The examination of the blood does not help us except to exclude the leukæmic conditions which have certain points of resemblance. In doubtful cases we should certainly have a biopsy made, and see how far the histology of the lesions will help to make clear the nature of the case.

I must not leave the question of diagnosis without a reference to the subject of sero-diagnosis. Gaucher, Joltrain and Brin published a paper on this subject in 1909. The serum reaction was obtained in a clear case of mycosis fungoides. A positive result was also obtained in two cases of pre-mycotic erythrodermia. In generalized psoriasis and pemphigus foliaceus it was negative. In the former case mycosis had been suspected but was negatived by a histological examination. In two cases of syphilis and four other cases the results were negative. Sera from mycosis patients gave a positive complement-fixation reaction with mycotic antigen. Sera from mycotic patients were negative to other antigens. Epithelioma and sarcoma were negative to the mycotic antigen.

A later communication on the same subject was published in 1912 by Gaucher, Paris and Guggenheim. Have any members of the Section any experience, confirmatory or otherwise, of these important observations, which are not only of value, if available, for diagnosis, but throw an important light upon the possible ætiology of the disease?

The differential diagnosis between the eruptions of lymphadenoma and leukæmia demands consideration. We find:—

In *lymphadenoma*, (1) infiltration of the skin appears *late* in the disease. It is an uncommon phenomenon, and the leading features are tense purplish, discoid infiltrations. There may be two or three such lesions close to each other or they may coalesce to form an irregularly outlined plaque. In the case I have in mind there could be no confusion with mycosis fungoides, as the lymphadenoma was of rather long duration, and the skin lesions were of late development. The lesions are similar in structure to a lymph follicle. (2) The *pseudo-leukæmic prurigo* or prurigo associated with lymphadenoma is quite different. There is an intense itching all over the body, and this pruritus may be accompanied by papules of prurigo. There is still

some doubt as to the exact nature of these papular lesions, some holding them to be definite lymphoid lesions. (3) A general exfoliative dermatitis.

In *leukæmia* (1) growths also occur in the skin. Nékám described cases which he believed to be definite instances of leukæmic infiltration. In an interesting case published by Rolleston and Wilfrid Fox the eruption appeared in the form of small blackish nodules on the lower abdomen in a patient suffering from myeloid leukæmia. These were situated in the true skin, and gradually increased to the size of a raisin, and ultimately spread all over the front of the body. Here the white cells were 730,000 per cubic millimetre; reds, 2,035,000. (2) Diffuse œdema, like infiltration of the face, suggesting leprosy has also been seen. (3) Large subcutaneous tumours varying in size from a pigeon's egg to a fist. In Sir T. Oliver's case, following an injury to a metacarpal bone, there were sixty tumours. (4) Growths resembling those in Rolleston and Fox's case, but of normal colour, yellow or brown.

Rolleston and Fox believe that the prurigos and pityriasis rubra-like eruptions are seen in lymphadenoma, and not in leukæmia.

Cases like that described by Pardee and Zeit, where the clinical picture is that of mycosis fungoides, but the blood changes those of leukæmia, are rare.

PROGNOSIS.

I am afraid we are unable even in the present day to say that we are able to do much more than relieve our patients and prolong life. The slow, painful course of the disease in many cases may be rendered less severe, and we may afford some remission of the intense, agonizing pruritus, but can we do more?

TREATMENT.

The history of the treatment of mycosis fungoides really begins with Allan Jamieson's paper in the *British Journal of Dermatology*, in 1904. Until that time the exhibition of arsenic and mercury were found to have a slight influence on the disease. In the X-rays we have a definite means by which we can give the patient relief and prolong life, even if we are unable to effect a permanent cure. On this last point I am anxious to obtain the experience of the members of the Section. I record my own experience in the short notes of my personal cases.

Miss Huie's careful microscopical researches show that the rays definitely cause an absorption of the infiltration, and that the corium returns to a healthy condition, and these results apply both to the erythrodermic and the tumour stages of the disease.

PERSONAL CASES.

I have had thirteen cases of undoubted mycosis fungoides under my observation. There are several others in which I have been in doubt. In two of these the subsequent history proved that the cases belonged to the parapsoriasis group. Of my thirteen cases, ten were males and three females :—

Male Patients.

(1) Private patient, aged 30, also under Dr. Stowers and Dr. Crocker. Duration, ten years. No syphilis. Erythrodermia with tumours. Rapid improvement under X-rays. Recurrence. Passed out of my hands. Since dead.

(2) Private patient, aged 40. Seen with Dr. Nixon Groves. No syphilis. Eruption began in India. Duration, three years. Characteristic erythrodermia with tumours. Improved under X-rays. Glands enlarged; spleen *nil*; pleuritic rub, and dullness right chest. Death. Believed to have metastasis in lung. No autopsy.

(3) Dairyman, aged 48. (London Hospital.) Onset, two years before with "boils." Excessive sweating, flushing; erythemato-squamous eruption scattered over body and limbs, one spot on face; pruritus intense; blood normal; glands not enlarged; spleen *nil*. Improved with X-rays.¹ Present condition unknown.

(4) Private patient, aged 48. Erythrodermia for several years; tumours. Relief from X-rays. Radium of no service. Much pain; wasting; diarrhoea. Death.

(5) The patient, aged 56, shown to-day by Dr. Pringle. Erythrodermia with tumours. Much benefit from X-rays.

(6) Railway guard, aged 56. (London Hospital.) Itching all over body for several years. Dark reddish-brown infiltrated patches on back for twelve months; later, lobulated tumours on back. X-ray treatment. Tumours disappeared, 1910, and have not recurred. Patient shown at Royal Society of Medicine.²

¹ *Brit. Journ. Derm.*, 1911, xxiii, p. 117.

² *Brit. Journ. Derm.*, 1910, xxii, p. 23.

(7) Private patient, aged 58. Duration, eighteen months. Began with spot on right arm; many characteristic pale red circinate patches with intense pruritus. No recent information.

(8) Caretaker, aged 58. (London Hospital.) "Eczema"; tumours for five years; general erythrodermia. Cleared up with X-rays. Recurrence. Diarrhœa; asthenia. Died at home. No autopsy.¹

(9) Private patient, aged 62 (veterinary surgeon). History of "seborrhœic eczema" for several years; ulcerated tumour of back when first seen by writer. Great improvement under X-rays. Relapses. Death two years after appearance of tumours. No autopsy.

(10) Private patient, aged 70. Had also been under Dr. Leslie Roberts. Duration, one year. Erythrodermia with tumours. Later history (?).

Female Patients.

(1) Hospital nurse, aged 48. Urticaria for two years. Autumn, 1908, a small spot on inner side of right thigh; this rapidly developed into a tumour; tumours rapidly appeared all over the body; groin glands enlarged. Admitted into London Hospital on September 8, 1909. Diarrhœa and vomiting. Died on September 20, with sudden collapse. Post mortem: Thrombosis of pulmonary arteries; glands in groin.

(2) Wife of cab proprietor, aged 53. (Dr. Pringle's case.) Erythrodermia with tumours for four years; mucous membranes unaffected; all hair lost. Much improved with X-rays. Relapses, and is now gravely ill. Diarrhœa, &c.

(3) Private patient, aged 57. (Dr. Norman.) July, 1912: Began with patch on leg, then on body; eruption, like lichen planus. May 6, 1913: Covered from head to foot; much itching, and furuncles from scratching. Mycosis diagnosed. June 15, 1913: X-rays all over; all tumours cleared up. April 22, 1914: Relapse, with several small growths.

The special points set for discussion are:—

(1) Has mycosis fungoides any relationship with the dermatoses of Hodgkin's disease and leukæmia?

(2) Is it the ultimate member of a progressive group of dermatoses which includes pityriasis rosea and the parapsoriasis? or,

(3) Is it a disease *sui generis*?

¹ *Brit. Journ. Derm.*, 1910, xxii, p. 25.

(4) The disease being so rare that very few dermatologists have seen many cases, can a diagnosis be made in the early stages (a) on clinical grounds? (b) by the histology?

(5) What is the cause of death in the fatal cases?

(6) Of the value of X-ray treatment there can be no question, but can anyone bring forward evidence that the rays are curative?

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DISCUSSION.

The PRESIDENT (Dr. J. J. Pringle), in congratulating Dr. Sequeira on his paper and in conveying to him the thanks of the Section for it, said that it was a model of what such addresses ought to be. Whilst omitting no point of importance, and raising some of novelty, it was, nevertheless, concise; and its facts and arguments were marshalled with such a nice sense of proportion that it was admirably calculated to evoke interesting and fruitful discussion.

Sir MALCOLM MORRIS, K.C.V.O., said the subject was a very large one, and members must feel much indebted to Dr. Sequeira for the masterly way in which he had dealt with it. He had had under his care, with Dr. Dore, two cases recently. One was that of a man, aged 52, who was shown before the Section a year ago.¹ The subsequent history of this case was as follows: The X-ray treatment was continued with considerable vigour, forty-six exposures in all being given, with the result that the larger tumours were removed. After a very brief interval there was a considerable relapse. X-ray treatment was resumed, and the greater number of the lesions, which were very large on his body, cleared up, every trace vanishing, and most of those on the face disappeared also, except one over the left eye, which was to him very interesting, because it was a recurrence of the old lesion, the original site of the disease in the patient. This large tumour suppurated to such an extent that in a month the patient died of exhaustion. The diagnosis in this case was, to his mind, difficult, and on first seeing the man he diagnosed sarcoma, for the reason that there had been no preliminary itching, and the patient denied having had any lesions of a pre-mycotic character. This, however, seemed doubtful when one came to examine him more carefully afterwards. When the case was first exhibited there had been little opportunity for thorough examination. After microscopical examination the diagnosis of mycosis fungoides was confirmed by Dr. Whitfield, who had removed a portion of one of the tumours for that purpose. Even if that microscopical examination had not been made, there would have been no doubt later from the clinical standpoint, because the tumours had then become characteristic. That led him to an important point—namely, to ask histologists how early in the course of the disease a definite diagnosis could be given, and at how much earlier a stage than it could be recognized clinically. If the histologist could diagnose it earlier it would be an important advance, because the application of X-rays could be begun in the early stages. He thought there was considerable danger in using large doses of the rays when the tumours in the disease had become very large and there was a risk of the patient getting general septicæmia. Dr. White's case, in America, seemed to prove that definitely. The same thing applied to tumours in severe

¹ See *Proceedings*, pp. 145-148, 186.

leprosy. But no doubt there were members present who could confirm the opinion that the use of X-rays in nodular leprosy, when used early, was very beneficial.

The second patient was a young lady, aged 28, of whom he showed photographs. Six years ago the patient noticed red irritable patches in the groin. These remained stationary for a few months and were then followed by similar patches on the chest, back and legs. The disease gradually extended by the enlargement of the patches and the formation of new ones, and when she came under treatment there were numerous lesions scattered over the trunk and limbs, but in this, as in the other case, the hands and feet were not affected. The patches varied in size and shape and in the amount of infiltration; a few were raised above the surface, but there were no definite tumours. A peculiar feature was deep pigmentation and marked infiltration of the nipples and areolæ. The irritation was severe and appeared to be generalized and not limited to the areas of disease. X-ray treatment was begun on June 26, 1913, four or five patches receiving a third of a pastille dose each day. After all the patches had been gone over twice, treatment was stopped for a month, and at the end of this time a marked improvement had occurred in all the lesions, which were paler and less infiltrated, and some had disappeared, leaving brown stains. The infiltration of the nipples had also subsided, but the pigmentation remained. The itching had also considerably diminished. From September 22 to November 1 half pastille doses were given, all the affected areas being exposed twice at intervals of about a fortnight. From January 16 to February 19 and from April 2 to May 6, 1914, the same process was repeated. Steady progress had been maintained, and at the present time the lesions were pale in colour and very slightly infiltrated. A few fresh patches had appeared, but these had yielded to treatment, although not so readily as the older and more thickened plaques. There had been no relapse of lesions that had completely disappeared. Itching was still present, but was not so severe and was now said to be confined to the affected parts.

There was no great difficulty in making the diagnosis in this case because of the clinical condition; but he had seen another group of cases in which it was difficult to form any opinion, and only in the tumour stage could one be at all certain, and then it was beginning to be too late to give effective treatment. He did think one could rely on the value of a history of early itching, which had been regarded as one of the prominent symptoms; sometimes the itching had been severe, sometimes so trivial as not to be worth noting.

Dr. Sequeira had asked whether this was a disease *sui generis*, or whether it was rather an ultimate manifestation of a progressive group of dermatoses. His own view was that it was a disease *sui generis*. He considered that these lesions, before the tumour formation, were not examples of various dermatoses, such as eczema, psoriasis, and lichen planus, but that they were the beginnings of mycosis fungoides. A parallel case was that of Paget's disease, which looked like eczema, but was not eczema; it was commencing carcinoma. The

symptoms referred to he regarded as the commencement of the malignant process. He had watched them, and they were of a character different from the diseases with which dermatologists were familiar. Light came through the subsequent history: it was an obstinate affection, on which no remedy had any effect. Dermatologists therefore looked to histologists to afford an early clue to the diagnosis, and as to the precise cause and mode of death in the fatal cases. In most of the cases, though not in the metastatic, he considered there was a septicæmia, which one could understand in such a condition. He had said enough to indicate what an enormous benefit X-rays were in this and similar diseases, and their value would be even greater if the means of earlier recognition which he hoped for were secured.

Mr. J. E. R. McDONAGH'S opinion of mycosis fungoides was that it was not a disease *sui generis* but belonged to a class which was best described as the intermediary cutaneous aleukæmic lymphocytomata, a class which also included lymphoderma pernicioso, lymphogranulomatosis cutis and the mycotic erythrodermia of the French authorities. "Intermediary"—i.e., links of a chain—which began as inflammatory lymphocytomata and ended as malignant lymphocytomata. Examples of the inflammatory lymphocytomata were the plasmomata caused by syphilis, tubercle, &c. Examples of the malignant lymphocytomata were the lymphosarcomatosis and the plasmosarcomatosis cutis. The intermediary types could either approximate the innocent or the malignant end of the lymphocyte chain. Hence cases of mycosis fungoides could be met with which were typical plasmomata, while others consisted of cells which were undoubtedly malignant. The type of cell constituting the growth varied according to the phase in the life-history of the lymphocyte which was called upon to protect the host. That is to say, either the lymphocyte itself responded or the response came in the form of the cell which the lymphocyte gave rise to—viz., the plasma cell, or the embryo lymphocyte, or the endothelial cell—the progenitor of the lymphocyte, would be implicated. If the attacking force was not severe the tumour would consist of plasma cells or lymphocytes only. If the attacking force continued, the protoplasm of the plasma cells would break up, or the protoplasm would become granular and ultimately disappear, leaving behind the nucleus, which would divide and subdivide, each subdivision containing one or more nucleoli. These would ultimately behave themselves as cells—act pseudo-parasitically so as to constitute malignancy. The same changes could be observed in the lymphocyte, the embryo lymphocyte, and the endothelial cells. The intermediary cutaneous aleukæmic lymphocytomata began as pure inflammatory lesions; therefore the so-called premycotic stage of mycosis fungoides could not be diagnosed by histological means alone. It not infrequently happened that when the cases belonging to this group recurred, the histological characters of the lesions were more malignant than the primary lesions, and the suggestion was offered that in all probability X-ray treatment increased the tendency towards malignant change. The attacking force was considered to be a continuation of the factor which was the original cause of that form of

inflammation which histologically consisted of lymphocytes and plasma cells—viz., tubercle, syphilis, &c. The intermediary cutaneous aleukæmic lymphocytomata were lymphocytomata which began in the skin. Analogous lymphocytomata could begin in the lymphatic glands or in other glandular structures. The former comprised what was called Hodgkin's disease and the latter Mikulicz's disease, both of which showed histological variations according to the phase in the life-history of the lymphocyte attacked and the concentration of the attacking force, analogous to those met with in mycosis fungoides. The remarks were from a paper which will appear with illustrations in a future number of the *British Journal of Dermatology* and the paper forms the second part of a general discussion on the relationship between inflammation and malignant disease, the first part of which is published in the *Archiv f. Derm. u. Syph.*, cxx, p. 289.

Dr. DOUGLAS HEATH (Birmingham) said he did not regard the small contribution he could make to the discussion as important, but he felt that Mr. McDonagh had rather combated the view which he had himself come to assert, for he considered that the previous workers in this histological field had rather established a view opposed to that now urged by the last speaker. He had seen Professor Leith's sections of mycosis fungoides, and he had demonstrated to him (the speaker) the daughter cells in such large numbers in the typical nodules of the disease that he was much impressed by his remarks in comparing those cells and the general appearances of the tumours with the cells seen in sarcomata, gummata of syphilis, and other granulomata. The multiform character of the cells of the nodules in mycosis fungoides seemed, to his mind, convincingly different from the plain type seen in Hodgkin's disease or other lymphatic nodules. The different types of epithelioid cell, the small daughter cell, and occasionally a few plasma cells—that multiplicity of cell—seemed to be in favour of mycosis fungoides, as opposed to sarcoma, &c. Clinically, he was unable to distinguish mycosis fungoides of the "d'emblée" type from sarcoma. He was indebted to Dr. Wynne, of the General Hospital, Birmingham, for the opportunity of seeing the following case: A man had a number of fungating tumours on the abdomen, of five months' duration, and they ran a rapid course to a fatal issue. He was found to have secondary nodules in lung, mediastinum, kidneys, liver, cerebellum, and, in fact, all over the body. But clinically, he did not think one could distinguish it from mycosis fungoides. When confronted with a section, however, there was no difficulty; he had sections under the microscope for members to see; they definitely showed that the lesion was a mixed-cell sarcoma. His experience of cases of mycosis fungoides had been small, but he would mention one, a patient aged 74, the father of a doctor, whom he was asked to see only two days before his death, for the purpose of seeing if he could arrive at a diagnosis. He did not think he would ever forget the case, for the whole of the head was enormously swollen, the ears were like those seen in a lepra case (though not so misshapen), the lips were greatly enlarged so that the whole expression was altered, and there was a moist eczema over the head and neck. Tumours

were present in large numbers on the abdomen, many of them fungating, there were enlarged lymphatic glands, the temperature was 103° F., and he gradually sank and died.

Dr. LANCASHIRE (Manchester) said he had had a slight clinical experience of the condition, though that was not quite recent. He was particularly interested in the second case described by Sir Malcolm Morris, of which he showed photographs, for he originally saw the patient himself in Manchester, and his provisional diagnosis was that it was the pre-mycotic stage of mycosis fungoides. It was interesting to him that this seemed to have been correct. Some years ago there was a small run of these cases at Manchester, for he saw some half-dozen cases in three years, of which he had photographs. They were of the ordinary type, some very advanced; and, from the histories given, all seemed to have commenced with a dry eczema—i.e., pre-mycotic lesions. Pruritus was marked, and the course was the usual one, though the lives of some were prolonged a year or two by X-rays.

Dr. BOLAM (Newcastle) said he had seen three cases of the condition in the last two years. One was diagnosed in London and sent on to him afterwards, because the patient lived in his district. He wished to emphasize what had been said as to the danger of using massive doses of X-rays. An autopsy was held on one of the cases, but nothing in the way of metastases, or any feature which might throw light on the aetiology, was found. All the cases of the condition he had seen had been in men of middle age, and two had been followed to their fatal issue. To him the nature of the disease remained a mystery, and he came in the hope of hearing it unravelled.

Dr. NIXON (Bristol) said he had had but a small experience of the condition under discussion. He had seen only two cases since 1909. One was that of a man, aged 65, who just passed through his out-patient department—i.e., for one day. A count showed his blood to be normal. On an attempt being made to induce him to enter the infirmary for further treatment and investigation, he fled, and he (the speaker) had heard no more of him. The other case was that of a young woman, aged 26. There was neither evidence nor history of syphilis. The commencement was a rash, looking like tinea versicolor, and it was treated for some time under that idea. After nine months she began to develop tumours, in the usual way on the erythrodermic patches. The sections showed typical mycosis fungoides. Her blood count was normal. Under X-rays the behaviour was that usually seen. The marked feature in her case was intense suppuration. Instead of these tumours fungating, they became crateriform, somewhat like blastomycosis. Vaccines were tried, but without the slightest improvement. One interesting point which he observed in connexion with that case, and which he thought excluded any connexion with lymphadenoma, was the character of the glandular enlargement. Although the suppuration was extreme and widespread, and though there were tumours from scalp to feet, the glandular enlargement never resembled

that of lymphadenoma; the glands were more like those seen in inflammatory conditions. She had not an enlarged spleen, and the only departure of the blood condition from the normal was some increase in the polymorphonuclears, probably due to the suppuration. She finally became covered from head to foot with huge fungating tumours and died suddenly from exhaustion at the end of two years from the first onset of the disease.

Dr. KENNETH WILLS, in response to the President's invitation, said he missed the only case which ever passed through his hands. It was a case of mycosis fungoides d'emblée, in which the tumour was on the frontal part of the scalp, in the position at which a man milking a cow would touch the animal, and he thought it was a case of trichophyton infection. But he could not find any fungus, and he took a section to the pathological laboratory, where it was pronounced to be endothelioma. He sent the case over to the surgeon, and lost sight of it entirely afterwards. He had heard that subsequently other tumours had developed and had been removed by the surgeon. Eventually the patient was sent to London, where he had been in the hands of the President, who diagnosed it as mycosis fungoides.

The PRESIDENT showed photographs of the case referred to by Dr. Kenneth Wills, before and after treatment by X-rays, which had proved



After X-ray treatment.

(temporarily at least) extremely beneficial. It was the example of mycosis fungoides à tumeurs d'emblée recorded and illustrated in the last (April) volume of the *Proceedings* of the Society (Derm. Sect., p. 156).

Dr. GORDON WARD said he was not a dermatologist and he had no cases to recount, but he would like to submit a criticism from the point of view of clinical hæmatology on the cases published as instances of mycosis fungoides, and brought before the Section as such. He spoke of the cases in which there was also considerable enlargement of glands and spleen. Probably the dermatologist looked at such cases from the standpoint of their being uncommon and interesting skin lesions, and probably classified them, if he did so at all, under those skin lesions. The hæmatologist, on the other hand, looked upon them as generalized affections of the lymph tissues, and would first want to know what was the nature of that generalized affection before considering the local skin manifestation. From that standpoint the analogy between mycosis fungoides and Hodgkin's disease and leukæmia appeared to be close; though perhaps not so close as was supposed by the speaker who suggested that they were phases of the same process. They had points in common; they tended to be chronic, they might all produce skin tumours the exact nature of which had puzzled dermatologists, they all reacted favourably to X-rays at first, while, equally certainly, they tended to recur. He would like to hear made plain what was the relation of these glandular enlargements to the skin lesions in mycosis fungoides. If the mycosic lesion was not coterminous with the original structure of the gland, the glandular enlargement was, presumably, in the nature of a secondary deposit from a malignant focus. Otherwise it was closely allied to leukæmia, which was a generalized affection, not a primary tumour on the skin with secondary deposits in the organs. Moreover, were there any clinical features peculiar to mycosic glands? Leukæmia was not, it might be noted, a disease which appeared as an unexpected termination of mycosis fungoides, or of anything else. There was, indeed, a form of secondary leukæmia, but this was more or less defined, and was not likely to cause much difficulty. Leukæmia was such from the beginning, even if there were no blood changes, or did not develop until later in the disease; in experimental leukæmia some infected animals never had blood changes, but they all had characteristic changes in the organs. The confusion with Hodgkin's disease was easier made than with leukæmia. He would regard them as separate diseases, although in the same general class, for which he did not think a specific name had yet been found. Some of the sections just demonstrated on the screen he thought would do equally well for those of Hodgkin's disease, for the lesions in the skin in that disease were not necessarily the same as those in the glands. He had some sections from a typical case of Hodgkin's disease, from all the organs, and all, except those from the skin, were typical of Hodgkin's disease. The latter might not have been recognized as Hodgkin's disease if it had not been for the associated gland lesions. Among other differences, there were no giant cells in these skin lesions. With regard to the cause of death in this condition, he would like to make one comment. Probably members had read of the recent death of a radiologist in Italy. All his organs, especially the blood-making ones, were found to be absolutely aplastic (he died with a bottle of Bland's pills by his

bedside); one heard of large doses of X-rays being given in these cases of mycosis fungoides. It would therefore be interesting to know whether death in any of these cases bore any relation to the dosage of X-rays. One would like to know how the organs appeared, and compare such (appearances) with the condition of the viscera of the radiologist he had mentioned.

(The Discussion was adjourned until June 4, 1914.)

Dermatological Section.

June 4, 1914.

Dr. J. J. PRINGLE, President of the Section, in the Chair.

Discussion on Mycosis Fungoides.¹

DR. JAMES GALLOWAY, resuming the debate, said that in discussing the question of mycosis fungoides we were placed in a position, the dangers of which had been carefully impressed upon us from our earliest youth—namely, that conclusions arrived at by reasoning from analogy were bound to be fallacious. If the foundations were not good any superstructure must be imperfect. The foundations of statements as to the cause of mycosis fungoides were imperfect in so many directions that it was impossible to draw trustworthy conclusions at the present time. The only possibility of discussion was to use the process of argument from analogy as carefully as possible, recognizing its many failures.

So far as the disease itself was concerned, he would be inclined to say that the condition was *sui generis*, from the point of view of what we saw in our patients, and also from the practical aspect of treatment this attitude of mind was well warranted. But consideration should also be given to information derived from other sources, and especially concerning diseases which presented analogies to mycosis fungoides. Two of these diseases had been especially mentioned by Dr. Sequeira in his opening speech—namely, the condition known in this country as Hodgkin's disease on the one hand, and on the other the various forms of leukæmia. Looking at these two diseases from the clinical point of view, there were certain analogies which could not fail to impress the observer. In Hodgkin's disease there were two cutaneous conditions associated with the malady. First, a generalized dermatitis associated with the appearance of pruriginous points and macules and pigmentation, often with lichenification, and frequently with pruritus of the most intense degree. Of this condition he had had some clinical experience, and had drawn attention to it on previous occasions. He did not think there was any state in which the suffering from pruritus was more intense than in this complication of Hodgkin's disease. The second condition was the formation of papules and nodules presenting cutaneous tumours, usually of small size, but sometimes as large as a broad bean, having histological features identical with the lymphatic

¹ Adjourned from May 21.

gland tumours characteristic of the disease. In the first condition there was no clear evidence of the formation of new cellular tissue in the skin or subcutaneous tissues; in the second there was definite tumour formation.

So also in the true leukæmias there were two conditions affecting the skin. First, a generalized pruriginous condition associated with thickening, lichenification, and often pruritus; secondly, the formation of true tumours resembling the nodules seen in the viscera. He had seen this condition in the myelocytic variety of the disease. No doubt it occurred also in the lymphocytic type.

Similarly, in mycosis fungoides there occurred two cutaneous manifestations. First, a dermatosis polymorphous in character, presenting certain resemblances at times to urticaria, to eczema, to psoriasis, and occasionally preceding for a long period of time the later developments of the disease. This condition was succeeded by the tumours of mycosis fungoides which were its most remarkable feature. Therefore, in these three maladies a generalized disturbance of the skin, accompanied or succeeded by the development of tumours, were outstanding features. The presence of the generalized early, or prodromal, eruptions brought to mind other prodromal eruptions of infective diseases, and lent colour to the view—which seemed to be the probable one—that mycosis fungoides, as well as the other diseases alluded to, were the result of some unknown infection of the human body. This explanation had long been suggested in the case of Hodgkin's disease, was frequently discussed in the case of leukæmias, and was strongly supported by the phenomena of mycosis fungoides.

Referring to the histological structure of the tumours in mycosis fungoides, he thought that the evidence was greatly in favour of the contention that the tumours were rather of the nature of what used to be called the "infective or specific granulomata" than of what we still described as new growths, such as a sarcoma or a lymphosarcoma. Indeed, the evidence derived from histology was less convincing of the distinct nature of these diseases than the clinical evidence. The clinical features gave the support to their differentiation into separate categories.

Members would recollect the paper written by Dr. MacLeod and himself some years ago,¹ based on cases which had come under observation at Charing Cross Hospital. The chief points of interest noted in the histology at that time were: (1) The resemblance of the new growth to the granulomata; (2) the great fragility of the new cells forming the granuloma; and (3) the peculiar characters of these cells which had now been mentioned by various investigators. The fragility of the granuloma might perhaps be taken as some indication of the special character of the infection, as compared with similar granulomatous growths.

In reference to the diagnosis, the speaker would feel more secure in arriving at a positive conclusion from studying the clinical appearances of the disease rather than the histological features alone, but for a satisfactory diagnosis

¹ *Brit. Journ. Derm.*, 1900, pp. 153-187.

information must, of course, be sought from both these sources. No evidence was yet forthcoming as to the exact nature of the infection producing mycosis fungoides. Some speakers seemed inclined to fall back on the suggestion that syphilis, or an infection resembling syphilis, might be the underlying cause, not only of mycosis fungoides, but also of the two analogous conditions to which he had referred. To parody an old saying, they felt inclined to take refuge in the argument of the *omne ignotum pro syphilitico*. So far as syphilis was concerned there seemed to be no evidence that this infection was concerned in any degree with the production of mycosis fungoides; nevertheless, certain clinical observations could not be completely put out of court as to the remote relationships of syphilis to the two other conditions, and it might well be that an infection of similar nature to the syphilitic infection could produce mycosis fungoides, and that the infective element still remained to be discovered—possibly as an ultra-microscopic object.

In reference to treatment, the argument by analogy might also give some information. Anyone who had seen cases of mycosis fungoides treated by X-rays could not fail to recognize the value of this therapeutic measure in modifying the course of the disease. It caused the tumours of the disease to shrink and disappear, prevented septic infection, and helped much in rendering life bearable to the unfortunate sufferers. So also in some cases of Hodgkin's disease and of the leukæmias, the use of the X-rays appeared to be of definite benefit, but guidance and even warning could be derived from the use of X-rays in both these states. He had had some experience of the treatment both of leukæmia and of Hodgkin's disease by means of X-rays. There seemed to be no doubt of the benefit derived in some cases, but danger occurred either by giving an over-dosage of X-rays at one or two sittings, or by an over-dosage over a long period, and by repeated applications. In the first case severe febrile reactions were apt to occur, and the patient was, at any rate temporarily, damaged. But the damage which seemed to ensue from repeated applications over considerable periods of time was graver still. There seemed to be distinct evidence that in such cases the blood condition tended to deteriorate, a severe degree of anæmia was produced, the white blood cells, at first, it might be, reduced in number to the benefit of the patient, tended to shrink below the normal, and finally a condition which has been described as an "aplastic state" of the blood-forming tissues and blood resulted. In mycosis fungoides over-dosage by a single application had been known to produce severe reactionary illness, and it was possible that repeated dosage might also tend to produce the aplastic condition seen in cases of leukæmia.

It must be recollected that the dermatosis and tumour formation of mycosis fungoides should be looked upon as the reaction of the tissues to the infective cause, possibly even an attempt to neutralize or eliminate the poison. Too vigorous destruction of new granulomatous tissues might well damage a patient by disarming him of natural methods of protection.

Considerable doubts evidently remained as to the possibility of cure by means of X-rays. There was no doubt that cases had recurred after the

use of X-rays. Possibly the safest line in X-ray treatment was to confine it to the destruction of the actual tumours as they appeared, and the prevention of the severe septicæmia which seemed to be frequently the cause of death in the disease.¹

Dr. J. H. STOWERS: Concerning the incidence of sex and age, I published in 1902 a summary of thirty-one cases, which had been variously reported during the previous ten years, which included twenty-one males aged from 25 to 72, and seven females whose ages ranged from 26 to 57, and three, of which the age and sex were unstated. Since that time fourteen cases have been reported by our members—viz., nine males and five females—the ages of the former ranging from 29 to 63 and the latter from 40 to 65. According to these combined groups it would appear that mycosis fungoides was two and a half times more frequent in males than females. Dr. Sequeira's table of cases, which is more extensive than mine, relates to forty-six males and twenty-eight females, which increases the proportion of the latter to more than a half. However, the fact remains that the disease occurs more frequently in males. I have never seen it in more than one member of a family. Concerning the reported longevity of the parents of such patients, as Dr. Pernet has pointed out, I have no information to give. Dr. Sequeira has distributed a paper containing six specific questions to which he invites special attention.

Question 1: Has mycosis fungoides any relationship with the dermatoses of Hodgkin's disease and leukæmia?

In this connexion I would refer to a remarkable case of multiple tumours of the skin which was exhibited in October, 1907, by Dr. Lediard, of Carlisle, at the first meeting of the Clinical Section,² which I had the opportunity of seeing. Numerous subcutaneous nodules were present in a male patient, aged 65, the first appearing on the left side of the chest wall. At that time an exact diagnosis was impossible. Two months later the nodules had enlarged and progressive general wasting ensued, an examination of the blood showing a considerable increase of the large mononuclear leucocytes. Subsequently, the liver enlarged and broncho-pneumonia supervened with further glandular enlargements and cutaneous swellings. The patient died in January, 1908, some free hæmoptysis occurring the third day before death. For a time it was considered doubtful whether the case was one of sarcoma, syphilis, or mycosis fungoides. Later it was suspected to be of leukæmic origin. Shortly before death the cutaneous and glandular swellings underwent a striking diminution. The final report of the Committee of Investigation was that "The lesions were due to some poison which gave rise to degenerative changes in the tissues involved, associated with hæmorrhage and œdema. There was no evidence to indicate the origin or nature of the poison." From a diagnostic point of view

¹ With reference to this point, it may be mentioned that Case I, described in the paper alluded to, died from septicæmia three months after leaving hospital in July, 1900. Dr. Lawrence Potts wrote as follows: "Our patient, Mrs. G., who had mycosis fungoides, died a shocking death last July, the discharge and disintegration of tissue being awful."

² *Proceedings*, 1907-08, i (Clin. Sect.), p. 18.

this case was of considerable importance in relation to our subject, but it fails to prove any relationship between mycosis fungoides and the dermatoses of Hodgkin's disease and leukæmia. Although histologically in leukæmia the regularity in the size and shape of the round mesoblastic cells and other changes in the skin may make it easy to differentiate from mycosis fungoides, clinically the distinction is more difficult. The skin lesions of leukæmia (and pseudo-leukæmia) have by several observers been associated with mycosis fungoides, but whatever the nature of its much disputed cell infiltration may be, whether it is a lymphoma or granuloma, it bears a greater resemblance to a syphilitic granuloma than to mycosis fungoides. In two cases reported as mycosis fungoides by Pye-Smith and Swinford Edwards respectively, we have two well-marked instances of a disease in which the independent microscopic examinations proved the existence of cells indistinguishable from those of a round-celled sarcoma, although, in the former case, some parts of the adrenal tumour resembled a lymphoma. Again, the characters of a lymphosarcoma are not sufficiently constant to explain its pathology. So far, then, I venture to think, there is no satisfactory evidence to prove a relationship between mycosis fungoides and the dermatoses of Hodgkin's disease and leukæmia.

Question 2: Is mycosis fungoides the ultimate member of a progressive group of dermatoses which include pityriasis rosea and the parapsoriasis?

I doubt very much (unless subsequent speakers can adduce histological evidence to the contrary) whether there exists any reliable data upon which to base an affirmative opinion. The cases I have seen and the reports I have read certainly indicate a negative answer.

Question 3: Is mycosis fungoides a disease *sui generis*?

It is fairly certain that the prodromal eruptions constitute part of the disease proper, and are not merely manifestations of the simpler disorders which they simulate and for which they are so frequently mistaken. I agree that however much the lesions may resemble each other, syphilis does not appear of any ætiological significance in the production of mycosis fungoides. It is a reliable statement to make that syphilis does not modify the general order of skin diseases but produces characteristic lesions of its own. Payne recorded a case having clinical appearances of mycosis fungoides while the tumours had a spindle-celled sarcoma character. The hypothesis that mycosis fungoides belongs to the class sarcomata does not account for the spontaneous diminution or disappearance of the new growths which so frequently occurs in the course of the disease, and, moreover, the bulk of evidence which exists at present points to a marked histological distinction between the two. Payne, who had an exceptional opportunity for clinical and pathological study, also concluded that it is best to regard the growth provisionally as a chronic inflammatory neoplasm or granuloma dependent upon some local irritant as yet undiscovered. The careful and detailed investigations of the morbid structure of the disease in the three reported cases carried out by Galloway and MacLeod in 1900 led them to the conclusion that mycosis fungoides should be placed in the class of infective granulomata. Eyre in his exhaustive

bacteriological examination of these cases (included in the report) stated that the bacillus of Friedländer had no proved connexion with mycosis fungoides and also that he had failed to observe a bacillus similar to that previously described by McVail, Murray, and Atkinson, of Glasgow. I do not think that at present we can safely go beyond these conclusions. But, as the disease is neither contagious nor hereditary, it is more than possible that future investigation will prove it to be due to the presence of a micro-organism directly or through the influence of toxins. Riecke and Radcliffe Crocker's cases of mycosis fungoides developing subsequent to injury must be borne in mind, but it is remarkable that in the whole series of cases recorded the possibility of trauma acting as a determining cause is only suggested in two. Most probably the relation was merely coincidental. The sum total of the evidence that exists at present certainly points to the conclusion that mycosis fungoides is a disease *sui generis*.

Question 4: Can a diagnosis be made in the early stage (a) on clinical grounds? (b) by the histology?

Concerning the subject of sero-diagnosis I have no experience. In the case of the male patient aged 30 which I reported in 1902 the "herald" patch occurred on the forearm, followed, within twelve months, by symmetrical lesions of similar character on the front and back of the chest. The advance of knowledge and clinical experience since the early days of the Dermatological Society of London, to which Dr. Sequeira has referred, have been so considerable that now on *clinical* grounds a diagnosis can almost generally be made. The continued investigations of the skilled pathologists in this country, apart from the valuable work being carried out in America and on the Continent, will surely hasten the time when, on *histological* grounds an early diagnosis will be made not merely possible, but certain.

Question 5: What is the cause of death in fatal cases?

Death has been brought about by septicæmia and exhaustion with, or without, intercurrent diarrhoea in the three cases I have been able to follow to the end.

Question 6: Can anyone bring forward evidence that X-ray treatment is curative?

The value of the X-ray treatment has proved to be great, as Dr. Sequeira says, both for the relief of symptoms and the possible prolongation of life. But although its beneficial influence in mycosis fungoides exceeds that of any therapeutic measure of which I have knowledge, I have never seen a case in which its adoption has led to complete recovery.

Dr. P. S. ABRAHAM expressed his regret that he had little or nothing to add to our knowledge on this interesting disease, which he still preferred to call "*granuloma*" fungoides, following the example of many authorities in America and elsewhere. He wished to associate himself with the compliment which had been paid to Dr. Sequeira, because his introduction was certainly most comprehensive and able, and all dermatologists would feel indebted to

him for it. Some eight or ten cases of the condition had been under his care, and all but one of them were males. From that experience he would say it was a disease pre-eminently of the male sex. Dr. Colcott Fox, however, considered that the sexes were about equally affected. He would not attempt to answer all the questions which Dr. Sequeira enumerated, for the very good reason that he could not. But in three cases which he saw in a quite early stage, he was able to make the diagnosis for the following reasons: The extreme pruritus and the great difficulty of influencing the patches of "eczema" which appeared, for even if the early lesions of granuloma fungoides disappeared under treatment, they very soon came back again. An early condition was shown in the photograph he handed round. Tumours developed later, and ultimately the patient went to University College Hospital, where he died. When he showed the case in its pre-fungating stage before the Dermatological Society of Great Britain and Ireland, great doubt was expressed by members as to it being granuloma fungoides. In at least one case he was in a difficulty as to whether the condition was mycosis fungoides or syphilis. In one instance, at the West London Hospital, an old soldier came with an extraordinary dark brown swollen mass about the shoulder. It was thought to be syphilis, and was treated accordingly; but mercury, iodide, and salvarsan made it worse. It was therefore concluded to be mycosis fungoides, and he showed the case as such before the West London Medico-Chirurgical Society. In another undoubted case of mycosis, the man said the first lesion he discovered was a wart on the penis, but there was no evidence that it was a syphilitic sore. He had made sections of cases of granuloma fungoides, both at Blackfriars Hospital and at the West London Hospital, but he could not find anything definite except a granulomatous growth. If he had time and opportunity he would now be inclined to search for a protozoon or a low form of animal organism, in which direction he thought there was a hopeful field for pathologists. Some of his cases had received much benefit from the application of X-rays. One bad case was kept alive four years by this means by the late Dr. Harrison Low. When the patient first came under notice he had numerous fungating tumours on the face and head and elsewhere.

Dr. WHITFIELD said that he would like first to comment on some of the contributions of previous speakers and then refer to the questions put by Dr. Sequeira. In the beginning he would offer a caution with regard to the cytology of mycosis fungoides. Mr. MacDonagh at the previous meeting had gone at length into the microscopical appearances of the cellular infiltration of mycosis fungoides, and had shown some very beautiful drawings made from histological specimens. He had not, however, stated from what period of the disease the tissue had come. Mr. MacDonagh had drawn their attention to lymphocytes situated within endothelial cells and also to certain round pieces of chromatin, and had explained these as lymphocytes developing in the endothelial cells and free developing lymphocytes. Dr. Whitfield thought that in reality these were phagocytosed lymphocytes within the endothelial cells and

chromatin fragments outside, and he was confirmed in this belief by the fact that the draughtsman had drawn in one or two of the specimens appearances strongly suggestive of partially digested lymphocytes. Dr. Whitfield said that he thought the histology of mycosis fungoides could be divided into four stages—namely, the stage of invasion, the stage of growth, the stage of cytolysis, and the stage of sepsis. Of course, these stages were not always sharply defined one from the other, but he thought that there was a practical use in the subdivision. The great fragility of the infiltration to which Dr. Galloway had referred, and which was first described by Unna, was found in the third stage. Next he would like to refer to the ingenious suggestion made by Dr. Galloway that there was a similarity between mycosis fungoides, leukæmia and lymphadenoma in that each of these diseases showed a prodromal eruption and a tumour stage. Dr. Whitfield would suggest, however, that this similarity was really only a superficial one, and would draw attention to the fact that in leukæmia and lymphadenoma the prodromal and tumour eruptions were fundamentally different histologically, and that the tumour eruption was not apparently a development of the prodromal eruption; whereas in his opinion (and he thought he should carry the balance of dermatological opinion with him) the tumours of mycosis fungoides were an actual overgrowth, that is an exaggeration of the pre-mycotic eruption. These remarks included all he had to say on the first question.

The second question he would answer definitely in the negative, and the third in the affirmative. The fourth question, relating to the clinical diagnosis by either clinical or histological examination, he would answer as follows: Although it might not be possible to diagnose every case in the early stage by histological examination alone, he thought it was certainly possible to do it by combined clinical and histological examination. Sir Malcolm Morris had confirmed him in this opinion by the case which he had narrated at the first meeting. A case which was such as to lead Sir Malcolm to hesitate between sarcomatosis and mycosis was histologically examined by him (Dr. Whitfield) and reported definitely as mycosis fungoides. After this histological diagnosis had been given, the character of the case changed far enough to make the clinical diagnosis of mycosis fungoides certain. The points that he relied on in the early case were the invasion of the interfascicular spaces by a fine oval-celled infiltration and the reaching up of this infiltration into the papillary body. In the earliest cases he had seen the epithelial tissue was not involved. Some of the cases that he had seen had not remained under his observation to the termination of the disease, but in those cases in which a fatal termination had occurred it had been from sepsis and exhaustion.

Lastly, in answer to question six, he would like to refer to one case which had been under his care. The patient was a man aged 63. He was brought by his doctor suffering from a pruriginous and rebellious eruption of six months' standing. When the patient was stripped the diagnosis of mycosis fungoides was immediately suggested; the whole of the trunk was covered with oval, infiltrated, brownish-red patches of various sizes, but all showed a sharply

defined margin. There were also two well-marked similar patches on the temples, sites that he considered very favourite ones for mycosis fungoides. The patches on the trunk had their long diameters in the lines of cleavage. A biopsy was made and the case taken to Dr. Colcott Fox who was also shown the section. Dr. Fox made a very confident diagnosis of mycosis fungoides and the patient was advised to submit himself to X-ray treatment. This was done by means of the pastille dose, no area having more than two pastille doses, and by the end of the summer of 1909 all symptoms except a certain amount of pigmentation had disappeared. Dr. Whitfield ascertained from time to time that he was well, and heard for the last time on the afternoon of the first meeting for this discussion, when he rang up his doctor, who said that he had taken a new lease of life and was without any symptoms. It was therefore five years since he was apparently cured, and during this time he had had no further treatment, since no relapse or fresh extension had at any time taken place. He did not wish to claim this dogmatically as a cure, but it was something very like it, and he believed the patient would have no further trouble from this disease. He congratulated himself especially on the fact that the case had been seen by Dr. Colcott Fox, whose diagnostic ability was so well known, as it went a long way towards making sure that this case was really one of the disease under discussion.

Dr. PERNET said that in his long association with the late Dr. Radcliffe Crocker he had had the opportunity of seeing and following up quite a number of mycosis fungoides cases both in hospital and in private. Moreover, he had had some cases of his own. Altogether he had notes of thirteen cases, eight males and five females.¹ Two of these were "à tumeurs d'emblée," one male and one female. He had observed these patients in various stages. The youngest was aged 28. Moreover, he had studied the disease at the Saint Louis Hospital, Paris, and had seen a good many of the cases exhibited in London and at various congresses. In the case of another patient, a woman, under the late Dr. Sydney Ringer, the diagnosis lay between sarcoma and mycosis fungoides (this was in 1899), but Radcliffe Crocker ultimately expressed the opinion it was the latter. Referring to the points that had been suggested for discussion he considered—

(1) That mycosis fungoides was not the same thing as leukæmia. He had never seen it associated with typical clinical Hodgkin's disease. With Dr. Radcliffe Crocker he had observed a case which was marked by recurrent attacks of lymphangitis leading to an elephantiasic form of thickening of the skin with tumour development for the final stage. (A male, 1897. See Radcliffe Crocker, "Diseases of the Skin," 3rd ed., ii, p. 982.) This case, as far as the great general swelling of the head was concerned, was apparently like the one alluded to by Dr. Douglas Heath.

(2) He considered that mycosis fungoides was a disease *sui generis* and probably parasitic. The parasite was perhaps ultra-microscopical. It had

¹ Some of these cases had been seen by other men as well.

taken a long time to discover the spirochæte of syphilis. He, like other observers, had seen mycosis fungoides develop as a result of long-standing so-called pre-mycotic dermatosis, commencing like an eczema. In one female case there was evidence of old syphilis, but eventually the mycosis fungoides nature of the case was undoubted. He had also seen the disease begin like a psoriasis, a pityriasis rubra, a seborrhœic dermatitis; and like an anomalous dermatitis herpetiformis (a male, 1913) at the time he first saw it. This last case had been seen by another medical man previously and diagnosed as an eczema. The type called "Homme rouge" he had also seen. There is one point in these so-called pre-mycotic conditions that had struck him in some instances—viz., the borders of affected areas were more or less concave instead of being convex; it was the apparently normal skin that penetrated convexly into the pre-mycotic areas. Again, islets of what looked like quite healthy skin were at times surrounded by the affected parts. But he could see no evidence of mycosis fungoides being "an ultimate member of the progressive group of dermatoses which includes pityriasis rosea and the parapsoriasis." Besnier and others had regarded the early dermatoses manifestations as mycosis fungoides from the beginning. He did not consider that mycosis fungoides had any relation to syphilis, though he had seen it occur in one or more syphilitics.

(3) As to the diagnosis in the early stages, he thought that this was sometimes possible on clinical grounds, if all the symptoms and factors, mode of development, reaction to treatment, and so forth, were taken into consideration. It was a question of "clinical instinct" to some extent and also of thinking of the possibility of mycosis fungoides. The reaction to X-rays would be an additional point, with other facts. He had in many of the cases found that there was longevity in the parents on one side, or more usually on both. This family history might mean something or it might not. At an early stage of infiltration it was possible that the microscope might be of service in bringing additional proof.

(4) As to the actual cause of death in mycosis fungoides, he had found it was usually due to septicæmia or to exhaustion. In the cases he had been able to follow up the end came very suddenly. In one male case a "phlegmon ligneux" of Reclus occurred about the right side of the neck and right temple, and was streptococcal. He had made the post mortem in that case (1898). The necropsy did not reveal any trace of mycosis fungoides metastases in the viscera, which he examined carefully from that point of view. In another male case (post mortem by Dr. Radcliffe Crocker and himself), nothing abnormal was found in viscera.

(5) The X-rays appeared to exert a wonderful and specific action on the infiltrations and growths, though the latter might disappear spontaneously (as observed before X-rays came into use). In the early stages of the infiltrating process X-rays were alone to be relied upon to keep the disease in check. But, unfortunately, the X-rays in his experience were not curative, and it was of the utmost importance that the patient should be kept under

observation and the X-raying repeated; but bearing in mind that in fungating cases repeated X-raying might do harm, as pointed out first by Dr. Charles White, of Boston, he, in the case of a woman, had injected radium emanations subcutaneously repeatedly, but he could not see that it did any good, and the patient eventually died. She presented many tumours, and, whilst under observation, suddenly became insane and had to be put into an asylum, but she recovered her reason, and again came under treatment.

In a recent case (a woman) of mycosis fungoides "à tumeurs d'emblée" he had recommended salvarsan as the patient was getting worse. But perhaps it did more harm than good, and he would not repeat it (or neo-salvarsan), except as a last resort and in small doses. In this case, too, the X-rays (after the salvarsan had been injected) did not appear to have the usual good effects one expected from them. Iodide of potassium he considered was contra-indicated.

Dr. GRAHAM LITTLE said he considered that the simplification of the classification of what dermatologists would accept as mycosis fungoides would be very desirable. The three types which had been generally recognized were: (1) the so-called Alibert-Bazin type; (2) the mycosis fungoides "à tumeurs d'emblée" type; (3) the (?) leucodermia perniciosa of Kaposi; probably the last of these would, by general consent, be now excluded from the list. His impression was that the second should also go out of the group. The "tumeurs d'emblée" type was different clinically and histologically. He thought it would simplify the consideration of the question, and be more in accordance with histological and clinical facts, to regard mycosis fungoides as a disease *sui generis*, and as confined to the group which began with the so-called pre-mycotic condition, and went on with that slow, relentless march which one saw in the universally accepted cases. The recognition of the "tumeurs d'emblée" group was largely due to Brocq, and Brocq himself now admitted that these cases were like sarcoma, and, indeed, indistinguishable from this disease. He (Dr. Little) had brought sections from six cases of mycosis fungoides for exhibition at the meeting. Three of them were true mycosis fungoides, presenting histological appearances entirely similar. The other three showed tumour formation, and the histology was different. In the first three cases there was marked acanthosis, and the characteristic cell infiltration of the papillary layer, with confinement of the disease largely to the superficial parts of the skin. To such a degree was it superficial that very much of the elastic tissue remained intact; this was an old observation which was confirmed by the sections now exhibited. The recognition of its being primarily and chiefly a skin lesion was very important, and it would help one to get rid of many misconceptions concerning the other diseases which Dr. Sequeira had included in his survey, such as leukaemia and pseudo-leukaemia. With regard to the latter, or Hodgkin's disease, Dr. Pye-Smith had made a very useful contribution to the differentiation.¹ In that contribution,

¹ *Brit. Journ. Derm.*, 1896, viii, p. 365.

based upon his large experience at Guy's Hospital (which was the birth-place of Hodgkin's disease), Dr. Pye-Smith had pointed out that "Hodgkin's disease, or, as it is oddly named in Germany, pseudo-leukæmia, is a definite clinical and pathological condition characterized by hypertrophy of the lymph glands, with anæmia and hæmorrhages. Lymphatic or lympho-sarcomatous tumours in the chest form another clinical group of intrathoracic growths, but neither have any real resemblance to Alibert's disease, in which the lymph glands are not enlarged, which has never been observed in children, and which affects the skin, and, with rare exceptions, the skin alone, a tissue never affected in true Hodgkin's disease." With regard to leukæmia, it was really difficult to say what was included under that elastic title; blood experts, like Limbeck for example, seemed to regard it as approximating more nearly to malignant growth conditions, and blood examination alone could not settle the matter. Whether the tumour stages of mycosis fungoides were to be included in the true leukæmias, or should be approximated to sarcomatous tumours, must be decided by further histological investigation. The clinical difficulty in accepting the sarcoma identification was great, especially considering the remarkably different age-incidence of the diseases. Mycosis fungoides occurred chiefly in older or even elderly persons, whereas sarcoma was usually seen in young people. But mycosis fungoides was not entirely confined to adults; for one of his sections came from a case at the Great Ormond Street Hospital for Children, that of a young boy with mycosis fungoides, which clinically seemed to be definite, and the histological sections showed the typical early acanthotic and superficially infiltrated stage. As far as he had been able to glean from the literature, the blood examinations in mycosis fungoides seemed to have been remarkably contradictory, and nothing had been established to confirm its approximation to the leukæmias. There did not seem, for example, to have been any marked or consistent leucocytosis. By these various methods of exclusion one was irresistibly led to the verdict that mycosis fungoides was a disease *sui generis*. Whether the tumour formation of mycosis fungoides must be regarded as the same process as was present in the early mycotic condition was a more difficult matter to answer. It was possible that the development of toxins in the pre-mycotic stage predisposed to the generation of tumours, in the same way as one saw in other diseases of the skin—for example, the association of xanthoma with diabetes, and the various conditions which had been called "pre-cancerous," as leading to the evolution of carcinoma.

Dr. F. PARKES WEBER: I wish to make some remarks regarding the clinical and pathological diagnosis of mycosis fungoides from certain varieties of leukæmia, &c. One of the most striking pathological characteristics of all cases of leukæmia, whether there be local tumour-like formations (as in cases of chloroma or "chlorosarcomatosis," and in cases of the so-called "leuko-sarcomatosis" of Carl Sternberg) or not, is the tendency to a fairly uniform infiltration or "permeation" of all the lymphatic glands and many of the viscera with leukæmic cells whether belonging to the lymphocyte series or the

myelocyte series. This is especially obvious in the liver, where microscopic examination after death reveals a definite interlobular (interacinous) distribution of the permeating leukæmic cells. I would ask: Has a similar permeation of similar distribution in the liver ever been discovered at the necropsy on a case of undoubted mycosis fungoides? I know one instance of its having been found after death in a patient who had the coarse "leonine" facies of the "pseudo-lepra" clinical variety of mycosis fungoides—but that simply proves that the case in question was in reality a case of leukæmia. It was, in fact, the variety of leukæmia described by Kaposi as "lymphoderma perniciosum," which Kaposi was right in separating from true cases of mycosis fungoides. It was by others, not by Kaposi himself, that his "lymphoderma perniciosum" was included as a pre-mycotic variety of mycosis fungoides. Hodgkin's disease, or "lymphogranulomatosis maligna," is so distinct clinically from mycosis fungoides that the difficulty is to find any clinical points of resemblance at all between the two. Pathologically both seem to belong to the group of "infective granulomata" (as tuberculosis, syphilis and leprosy do), but in neither of them has the causative microbic agent been yet discovered. I do not think that "pseudo-leukæmia" should be brought into the discussion; because if the term in question means anything at all nowadays, it ought to mean a condition in which the lesions exactly resemble true leukæmic lesions, but in which they are not accompanied (that is to say at the time of examination) by any characteristic blood changes of leukæmia. Dr. Gordon Ward in his remarks, I think, referred to "secondary" leukæmia, but surely a *leukæmia cannot be secondary*, that is to say, in the sense in which a leucocytosis is spoken of as secondary; though one may suggest that it is secondary to traumatism, syphilitic bone disease, or malaria, if in a given case one believes that the leukæmia has been "excited" by traumatism, &c.

Dr. MACCORMAC said he had recently had the opportunity of studying the histology of three cases of mycosis fungoides. The appearances were, in his opinion, by no means of so definite a nature as to enable a firm diagnosis to be made from microscopic evidence alone. Perhaps the most characteristic feature consisted of the accumulation of cells of a rather indefinite type in the papillary and sub-papillary layers. Acanthosis was apparently not a constant feature in any stage of the disease, so far as the sections examined went. In one case well-marked giant cells, as definite as those of tuberculosis, were present even in the preparations made from an erythematous (pre-mycotic) patch. In this particular patch the characteristic infiltration was quite definitely present. Generally speaking, the appearances so well described by Unna were to be seen. With regard to the relationship of this disease to the sarcomata, there was now definite evidence that it did not belong to this group. Sections stained by Beckton's method for Altmann granules (fixing in weak formol-Müller, staining with aniline acid fuchsin and differentiating with picric acid alcohol) demonstrated the presence of these granules in the cells. This test was an exceedingly important and accurate one, enabling a distinction

to be made from the cells of sarcoma and certain carcinomata where the granules were absent. In the treatment of the disease, its ready response to X-rays was very much against any relationship with syphilis, where X-rays usually aggravated the skin condition.

Dr. J. M. H. MACLEOD said that he wished to confine his remarks chiefly to the question of the early diagnosis of mycosis fungoides and the assistance given by the histological architecture in making it. He considered that mycosis fungoides was a disease *sui generis* and capable of being distinguished, both clinically and histologically, from leukæmia and Hodgkin's disease. He agreed with Dr. Little that the type of case described by Kaposi under the heading of lymphoderma perniciosum was not mycosis fungoides, but probably belonged to the ill-defined group of the leukæmias. With regard to the type in which "tumeurs d'emblée" occur, he thought it possible that such cases might belong to a different category from the ordinary cases with a pre-mycotic stage. He considered that the most reasonable heading under which to place mycosis fungoides in the present state of our knowledge was that of the "infective granulomata," and regarded it as an infective disease due to some unknown specific virus. He had examined a large number of sections of mycosis fungoides in the pre-mycotic and also in the infiltrated and tumour stages, and considered that the type of cellular infiltration which occurred was constant throughout, except that in the later stages of the disease the cells tended to disintegrate and showed what Unna had described as "crenation" and "fragmentation." The changes which occurred in the epidermis he regarded as secondary, but he believed that the type of cellular infiltration and its distribution were sufficiently characteristic to be of diagnostic value. He showed drawings of the microscopical appearances in the early and later stage of the disease and pointed out the different types of cells which are usually met with. These had been described in detail in the paper by Dr. Galloway and himself in the *British Journal of Dermatology*, 1900, xii, p. 153. He considered that the infiltration most nearly approached that which has been described under the somewhat indefinite title of a granuloma. He regarded the histological architecture as sufficiently characteristic in a well-marked case to distinguish mycosis fungoides—even in the pre-mycotic stage—from simple inflammatory conditions, such as psoriasis, eczema, or pityriasis rosea, and from other members of the so-called infective granuloma group, such as tuberculosis, syphilis, or leprosy, from leukæmia, Hodgkin's disease, and from neoplasms like sarcomata. He considered that the same pathological process was operative throughout and that the tumours were simply the further development of the pre-mycotic cellular infiltration.

Dr. DORE said his short contribution to the debate would have reference to the effect of X-rays on mycosis fungoides. He had treated the two cases already referred to by Sir Malcolm Morris. One of them was in a comparatively early and the other in the later tumour stage of the disease and

thus afforded favourable opportunities for observation. In speaking of the characters of mycosis fungoides Dr. Galloway had used the word "dramatic," and this term might justly be applied to the effect of X-rays on the tumours of mycosis fungoides. After even a half pastille dose inflammatory reaction sometimes began as early as the third day, was at its height in a week, and at the end of a fortnight or three weeks the whole tumour might have completely disappeared. If only half the tumour were exposed it would be absolutely cut through, half of it being healed and the other half left as it was before. Under the influence of the rays the tumours literally liquefied and melted away, and healed without leaving scars. Moreover, in one of the cases there was regrowth of hair on the scalp over previously affected areas, a fact which had also been noted by the President in a patient he had shown at a previous meeting. In speaking of the specific effect of the rays on mycosis fungoides it was important to remember the extreme instability and tendency to degeneration of the lesions. Before X-rays were used the tendency of the tumours to heal spontaneously or to slough away was well known. In reference to that point, he would draw attention to the fact that the older and more advanced lesions of mycosis fungoides were more easily affected by the X-rays than the earlier ones, and he thought this was partly due to the tendency of the tumours to degenerate and break down. His third point was the apparent failure of the X-rays to affect the real cause of the disease. In spite of the marked benefit resulting from X-ray treatment and the fact that the lesions seldom relapsed *in situ*, fresh patches continued to appear, and it seemed that while one could do much for the local lesions the disease itself remained uninfluenced. He was interested to hear of Dr. Whitfield's case, but he feared that the ultimate result of X-ray treatment on mycosis fungoides was not a very hopeful one. In the two cases he had referred to there was a somewhat conspicuous absence of lesions on the extremities, and he would like to ask Dr. Sequeira whether this was usual in mycosis fungoides.

Dr. TRAVERS SMITH said his experience of the disease under discussion was almost *nil*, but he was associated with the case of a young lady, aged 26, who had mycosis fungoides with tumours "d'emblée," and who lived about three years after the commencement of the disease. She was under the care of Dr. Colcott Fox. She, like the other cases which were spoken of, was benefited by the application of X-rays, and her skin was very bronzed, a point which has not been alluded to in this debate. Osler, in his description of Hodgkin's disease, described several cases in which this bronzing was very marked.

The PRESIDENT said it had been his rather exceptional experience to meet with eighteen cases of undoubted mycosis fungoides—eight in hospital and ten in private practice. He exhibited a water-colour drawing of the first case he had seen, in 1878, the previous diagnosis of which had been "eczema-psoriasis." In only one case was there any history of traumatism as a determining cause,

PRIVATE CASES.

No.	Name	Age	Sex	Nationality	Age at onset	Course of disease	Remarks
1	Vol. iii, 1893	23	M.	English, had lived in Canada	22	Shown before the Dermatological Society of London in January, 1902, and fully reported by Dr. Stowers; the changes in the nine years since first seen were surprisingly slight	<i>Primary lesions</i> : Began as a red patch in bend of right elbow; when seen there were extensive and well-defined erythematous and scaly patches like parapsoriasis over shoulders, loins, abdomen, buttocks, thighs and legs, with much pigmentation; had been diagnosed as urticaria, psoriasis and leprosy; itching not specially marked
2	Vol. v, 1895	47	M.	Yorkshire-man, living in Russia	44	Last seen in 1897; condition had become much worse and tumours appeared on trunk and face	<i>Primary lesions</i> : Numerous extensive patches of erythema and lichenification over back, trunk, limbs and face; a heavy drinker; intense itching, terribly aggravated by treatment with chrysarobin in Germany
3	Vol. viii, 1897	19	F.	English (Jewess)	17	Subsequent course rapid and reported to have died of typical mycosis under Dr. Colcott Fox	<i>Primary lesions</i> : Large areas of lichenification, over which bullae formed, on right thigh; spread rapidly to buttocks, thighs, arms and back, with pigmentation; itching extreme; face unaffected
4	Vol. xiii, 1899	64	M.	Yorkshire-man	Eight months previous to being seen	Extremely rapid; died under distinguished surgeon about a year afterwards; seen only once and diagnosis was missed, but numerous multi-form tumours appeared and ulcerated	<i>Primary lesions</i> : Very severe urticarial and papulo-vesicular eruption all over trunk and limbs, suggestive of dermatitis herpetiformis; itching intense, with extreme mental agitation
5	Vol. xix, 1903	46	M.	Welsh	44	Improved greatly under sixteen X-ray exposures; not seen since end of 1903	<i>Mycosis d'emblée</i> : Tumours affecting face, scalp, neck and upper part of trunk; sent with suggested diagnosis of blastomycosis
6	Vol. xxi, 1904	55	F.	Scotch	53	Early lesions did well with X-rays; subsequent progress unknown	<i>Primary lesions</i> : Began as "nettle rash" with goose-flesh and patches of vesicles; then had circinate lesions on face and chest (diagnosed as erythema-urticaria); when first seen had severe lichenification, infiltration with a few tumours on legs and thighs; itching intense

7	Vol. xxvii, 1907	Madame P.	39	F.	Swiss	15 or 16	General health still apparently good	<i>Primary lesions:</i> Extensive lichenification on trunk, arms and legs; <i>nil</i> on face; no lymphatic involvement; been treated for many years in various countries with X-rays and presented deep scars from them all over trunk and limbs; been under many distinguished dermatologists
8	Vol. xxv, 1907	W. E.	52	M.	English	50	Seen only once, but reported to have died in 1910	<i>Primary lesions</i> diagnosed as psoriasis; presented very large ulcerating psoriasiform patches, over trunk, limbs, scrotum and neck; <i>nil</i> on face; itching intense; had been treated in various clinics in Germany; no X-rays; greatly aggravated by intensive chrysarobin treatment
9	Vol. xxx, 1910	Mrs. B.	51	F.	English	46 to 47	Improved greatly under eighteen injections of orsudan from November, 1910, to end of April, 1911; now under Dr. Sequeira and reported to have greatly improved under X-ray treatment	<i>Primary lesions:</i> A practically universal erythrodermia, with copious desquamation and extensive areas of lichenification and deep pigmentation; eyelashes and eyebrows fell early in the disease; skin of face was deeply pigmented and atrophic, causing ectropion and immobile lips; itching extreme
10	Vol. xxxvi, 1913	Mrs. Y.	41	F.	Scotch	35	Seen only once; <i>in statu quo</i>	<i>Primary lesions:</i> Large erythematous patches and tumours on trunk; face unaffected; no lymphatic involvement

HOSPITAL CASES.

1	1887	H. W.	45	M.	English (Devonshire)	For several years supposed to have psoriasis, then "eczema-psoriasis"	Lesions disappeared under massive doses of arsenic intramuscularly, but recurred six months afterwards, when he resumed drinking habits; died of double pneumonia in 1891, in course of which lesions again completely subsided	<i>Primary lesions:</i> Had been diagnosed as "eczema-psoriasis"; an extremely heavy drinker; lesions immensely hypertrophic, scaly patches over limbs and trunk, scalp and forehead, with much pigmentation; no lymphatic involvement
2	1899	F. Y.*	43	M.	English	40	Disease kept in abeyance by frequent exposures to X-rays and latterly by arc lamp	Previously had suffered from syphilis; <i>erythematous patches on trunk, arms and legs</i> ; originally had <i>tumours on face</i> ; during last eight years has attended hospital thirty times per annum, having four or five pastille doses at each visit

* Four photographs, taken in 1899, p. 231. Shown as clinical case at previous meeting, p. 187.

HOSPITAL CASES—(continued).

No.	Name	Age	Sex	Nationality	Age at onset	Course of disease	Remarks
3	Rebecca W.*	71	F.	English (Jewess)	About menopause at 45	Death; bronchitis and exhaustion	<i>Primary lesions</i> diagnosed as ulcerative psoriasis and also as syphilis; tumours on arms, legs and shoulder; face unaffected <i>Tumours "d'emblée"</i> ; tumours affecting trunk and legs; no lymphatic involvement; reported by Dr. Pernet
4	H. P.	45	F.	English	Nine months previous to admission	Death; patient developed pleurisy with effusion and died two months after admission to hospital	
5	J. M.	41	M.	English	37	Considerable improvement under treatment with X-rays and salvarsan	
6	S. L.	40	F.	English	39	Improved very much under treatment with X-rays and arc lamp	<i>Primary lesions</i> : Patchy roughness of skin, which irritated considerably; presented enormous thick patches of erythrodermia and lesions in various stages of infiltration; tumours in groins and abdomen; previously diagnosed as syphilis and lichen hypertrophicus; face and upper part of trunk unaffected, but much lymphatic involvement; no definite blood changes <i>Primary lesions</i> : Erythrodermia, pruritus severe; lymphatic glands early and markedly involved, especially cervical, axillary, and inguinal; small nodules on face, arms, trunk and legs; no definite blood changes
7	K. A'H.	35	F.	Irish	33	Greatly improved under X-rays; still under observation	<i>Primary lesions</i> resembled lichen spinulosus; intensely itchy; over whole of trunk and face and in scalp; no definite blood changes
8	M. B.	48	M.	Welsh	45	Tumours rapidly subsided under X-rays†	<i>Tumours "d'emblée"</i> : Tumours affecting face, scalp, arm, groins; attributed to blow with barnacled spar; no enlarged glands

* One photograph, p. 232.

† One photograph, p. 210.



FIG. 1.



FIG. 2.



FIG. 3.

Hospital Case No. 2. Mycosis fungoides with tumours appearing early on face.
Englishman, aged 58. Age of onset, 40. Photographs taken in 1899.

being that of the man referred to by Dr. Kenneth Wills and reported in a recent number of the *Proceedings*,¹ photographs of which before and after treatment by X-rays he passed round. Appended (p. 228 *et seq.*) is a brief tabular statement of the main characters of his eighteen cases.

The following points seemed worthy of attention: The incidence was identical in the two *sexes*; in only one case was there any evidence of antecedent syphilis, and in it, as well as in all the other cases coming under observation since the introduction of the Wassermann test, the reaction had been con-



FIG. 4.

Hospital Case No. 3. Early lesions like psoriasis. Woman, aged 71; age of onset about 45.

sistently negative. As to *nationality*, four of his five private male cases were English (one of whom lived in Russia and another had long been in Canada), the other being Welsh; and of his five female cases, two were English (one a Jewess), two were Scottish, and one Swiss. Of his eight hospital cases, three males were English and one Welsh, while three females were English (one a Jewess) and one Irish.

¹ *Proceedings* (April, 1914), p. 156.

Age-incidence.—In a Swiss lady the disease apparently began about the age of 15, and in one English (Jewish) patient at 17. In the remaining sixteen cases it started at about 45 years of age on the average.

Mode of Onset.—As far as could be gathered from the statements of patients or the reports of their medical men, or from his own personal observation, this appeared to have been as follows:—

	Males	Females	Total
Mycosis à tumeurs d'emblée ...	2	1	3
Lesions like psoriasis ...	2	1	3
Lesions like parapsoriasis ...	1	1	2
Urticarial lesions with vesicles ...	1	1	2
Extensive lesions like lichen or lichenification ...	2	1	3
Patchy erythema with early tumours ...	1	1	2
Lesions like lichen spinulosus ...	—	1	1
General erythrodermia with lymphatic enlargements ...	—	1	1
An indeterminate dermatitis ...	—	1	1
			18

He formulated his answers to Dr. Sequeira's points for discussion as follows:—

(1) Careful examination of the blood in all his recent cases had failed to reveal any constant or characteristic abnormality, although in three cases there had been a persistent moderate degree of leucocytosis which could not be accounted for by the presence of any suppuration. Even in those cases in which there had been marked enlargement of lymphatic glands and spleen, probably conforming to the Kaposi type of "lymphodermia perniciosa," the diagnosis from leukæmia had been a matter of facility. In the few cases of true leukæmic prurigo which had come under his observation the skin lesions did not very closely resemble or correspond with any of the early recognized lesions of mycosis fungoides.

(2) He could not but think that an experienced and skilled clinical observer could almost always differentiate with ease the early so-called pre-mycotic lesions of the disease under discussion from the much more superficial epidermic lesions of "parapsoriasis," or "pityriasis rosea." Indeed, he considered Brocq's diagrammatic figures of "faits de passage" as merely interesting figments of the brilliant author's mind, and not as practical, solid results of or aids to accurate pathological or clinical observation.

(3) Severity of itching he regarded as certainly a valuable assistance in diagnosis in the early stages, as it is often out of all proportion to visible skin changes. Its presence was, however, certainly not constant. He was inclined to place great importance, as an aid to early diagnosis, upon the point that the early eruptions do not exactly correspond to any well-recognized types of skin disease. They were "indeterminate," "eczematoid," "lichenoid," "psoriasiform," "erythrodermial," &c. One type of lesion, however, to which Dr. Whitfield had

referred, had always struck him as very suspicious, if not actually pathognomonic. It consisted of raised, pad-like, infiltrated, erythematous, persistent patches, sometimes completely circular, but generally crescentic or discoid; an example of the condition was seen in a patient exhibited by Dr. Dore at the previous meeting, for diagnosis. He had difficulty in believing that the diagnosis in the earliest stages of a disease so multiform in its primary lesions could be firmly established by microscopical examination, although doubtless that was a consummation devoutly to be wished for. There was little room for doubt that mycosis fungoides was a clinical entity, but further investigation was clearly necessary to decide whether it was a disease *sui generis* or one of a series of lymphatic affections as adumbrated by Mr. McDonagh in his extremely valuable and suggestive contribution to the debate; but our present knowledge seemed to be against this view and to point to a definite specific micro-organism as its *materies morbi*. He agreed with those speakers who differentiated cases *à tumeurs d'emblée* and "lymphoderma perniciosum" from true mycosis fungoides and he would have submitted the proposition had not Dr. Graham Little done so.

The cause of death in three of his own cases had been bronchitis with general marasmus, empyema, and double pneumonia in an alcoholic. He could not accept as examples of true mycosis fungoides cases reported to have presented metastatic growths after death, although they might be considered as examples of other types of the "lymphatic series."

Members were in general accord as to the value of X-rays in treatment and the futility of all other remedies, including salvarsan. He had never seen the occurrence of the aplastic condition, referred to by Dr. Galloway, resulting from the prolonged administration of the rays. The case referred to by Dr. Whitfield impelled him to mention a case which he had seen once in hospital in July, 1913. The patient was a man, aged about 60, who presented numerous tumours over the trunk and limbs which he diagnosed as mycosic, but without making accurate notes of the condition. The man had not returned to the Skin Department but had attended the Electrical Department on several occasions, receiving in all twenty-four full pastille doses of X-rays. He had hunted him up in North London in order to show him at the previous meeting, but all traces of tumours had disappeared and the man was apparently quite well! The case did *not* figure in his tables.

In conclusion, he would like to add a few words in his Presidential capacity. He thought he was now entitled to congratulate the Section on the debate which had been inaugurated by Dr. Sequeira's paper. It had been on a high scientific plane, and he expressed his conviction that it would long be regarded as a classic for general reference on the subject of mycosis fungoides.

Dr. SEQUEIRA, in reply, said he felt that at such a late hour it was his duty to be brief, therefore he would touch on only a few points. He had been delighted to hear the points which the debate had given rise to, and from them he believed much had been learned. He personally looked upon mycosis

fungoides as a disease *sui generis*. He agreed with those who said that clinically the dermatosis of Hodgkin's disease and leukæmia was not like the early conditions met with in mycosis fungoides. Members had heard much of aleukæmic leukæmia; he understood there was a condition of leukæmia at the end of leucocythæmia; but that type of condition was not likely to be mistaken for mycosis fungoides, and the remarks made upon that were, he thought, submitted on purely hæmatological, not on clinical grounds. It was interesting to him to hear the statement made that it was possible by X-raying to hasten the end of patients suffering from mycosis fungoides by the effect on the blood. He had already referred to White's case, in which there was septicæmia due to breaking up of mycosic tumours. But before the X-rays were introduced people died from the septic conditions, and at an earlier stage than now. The rays increased the erythrocytes in all extensive dermatoses which were X-rayed. It was a common observation, and he had seen it himself in more than one case of mycosis fungoides. He agreed with those who said there was nothing in the blood-picture upon which a diagnosis of mycosis fungoides could be made. Where there was a large leucocytosis the case was probably one of another disease.

As Dr. MacLeod said, the crux of the debate was the question whether one could, in the present state of knowledge, make a diagnosis of early mycosis fungoides on clinical and histological grounds. The speaker agreed with Dr. Whitfield when he said a combination of the two methods was the correct course. He thought that in many cases the diagnosis could be arrived at on clinical grounds alone. The lack of exact conformity to any common dermatosis put the wary man on his guard. In some cases there could only be a strong suspicion in favour of the condition being mycosis fungoides, and the expert histologist could afford valuable help in these, though some of the experts did not seem prepared with criteria on which the clinician could rely. The whole process, from beginning to end, he regarded as one, and with that view histologists agreed; that there was a progressive infiltration of the same type, and that such conditions as fragmentation were epi-phenomena, not connected with the original process.

Dr. Dore had asked as to the involvement of the extremities. He had not paid special attention to that point, but one case which the President and he had now under observation had the extremities definitely affected; it was of the primarily erythrodermic type. He could not say much concerning bronzing of the skin in the disease, but in patients who had long suffered from the disease there was an alteration in the colour of the skin, and he regarded that as due to diapedesis, aided perhaps by the large doses of arsenic which many of these patients took, as well as the X-ray treatment.

Dr. MacCormac's observations on the Altmann granules in sarcomatosis and mycosis fungoides would be an additional point of assistance in the differential diagnosis.

In connexion with Dr. Whitfield's case of cure by X-rays, Dr. Sequeira mentioned the case of a railway guard, whom he showed in 1910, with large

mushroom-shaped tumours on his back. He was X-rayed and the tumours disappeared, and for the last four years he had remained absolutely free. It was one case out of thirteen, and he was prepared to admit it might not be of the ordinary form.

He was grateful for the way in which his effort had been received, and for the kindly remarks which had been made.

Dermatological Section.

June 18, 1914.

Dr. J. J. PRINGLE, President of the Section, in the Chair.

Two Cases of Erythema due to Carbon Monoxide Poisoning.

By IVOR J. DAVIES, M.D.

THE clinical aspect of the Senghenydd Explosion was notable for the occurrence of cutaneous lesions, which are recorded for the first time as manifestations of carbon monoxide poisoning. Dr. Ivor J. Davies expressed his regret that the cases did not now show any traces of erythema, though this was present when he addressed the Neurological Section a month ago, and so the cases were not now shown. Acute erythema occurred in nine of eighteen survivors, rescued after an exposure to the noxious fumes in the mine for twenty hours. The lesions most commonly involved the buttock, and generally the skin over the tuberosity of the ischium was affected. In other situations the skin over bony prominences was most commonly affected. The patches were of irregular shape and attended by considerable swelling of the part, and of a brilliant cherry-red colour which faded on pressure. The patients complained of considerable pain in the regions affected, which were very tender. Absolute anæsthesia was present over the areas of skin affected by acute erythema. The lesions took several months to subside, and anæsthesia was a marked feature throughout, and was still evident in some of the cases after a period of six months. These facts strongly suggested that the cutaneous lesions of carbon monoxide poisoning are of the nature of an angio-neurosis, whilst pressure

merely determined the situation of the lesions and was not the causal factor.

Erythematous lesions similar to those already described were found on several of the bodies brought up within a few days of the disaster. The remaining bodies were not brought out of the mine for several weeks, whilst some could not be removed from under falls of roof for several months. Thus systematic examination was impossible owing to decomposition, and the necessity for prompt removal after identification and certification of the cause of death.

The facts just described went far to support the view expressed by the writer that the cutaneous lesions were not primarily pressure phenomena, but true manifestations of after-damp poisoning.

The PRESIDENT said that there seemed to be a general consensus of opinion that the views of Dr. Ivor Davies as to the nature of the lesions were correct.

Pellagra with Skin Eruptions.

By E. G. GRAHAM LITTLE, M.D.

THE patient was a boy, aged 17, who had been under the care of Dr. S. A. Clarke, of Horley, who had diagnosed the case as pellagra when the skin symptoms had made their appearance. The history was very interesting and was as follows: The boy had been perfectly well up to April, 1913. A photograph taken shortly before this date showed a robust youngster for his years. The story given by the lad was that he was bathing in the river, and while in the water got stung by some fly, not identified, on the shoulder and scrotum. The lesion suppurated in the first site and was cauterized by Dr. Clarke, and a scar the size of a shilling remained visible on the right shoulder. From this date the boy began to be ill and to waste. The only written records of the case were to be found in the entries in Dr. Clarke's ledger and day-book, which he had been kind enough to supplement with his recollection of the symptoms for which treatment, there detailed, was given. Thus, in July there was an entry that he was for some weeks on a course of bismuth, which was prescribed for gastro-intestinal symptoms accompanied by vomiting and diarrhoea. Wasting became so pronounced that tuberculosis was suspected, a diagnosis which received support

from the fact that the boy presented signs of pleurisy with effusion, which was relieved by tapping the chest in August, 1913. About the same time he was seen in London by Dr. Sidney Phillips, who suggested the diagnosis of abdominal tuberculosis, the mesenteric glands being enlarged. Some deepening of pigmentation of the skin about the back lent support to a suggestion that there was tuberculous affection of the suprarenals. There were no signs of pulmonary tubercle. He was seen frequently by Dr. Clarke during the early months of this year, and prescriptions of calcium chloride, quinine, and creosote were recorded. The patient had ceased to follow his occupation as a mechanic's assistant some time in May, and he was treated on the lines of a tuberculous patient, with a plentiful diet, and fresh air and rest, but was not kept in bed.

On April 9, 1914, he was able to take a four-mile walk. The following day (Good Friday) he was "burnt by the sun" while sitting in the garden, and the skin became reddened and swollen on the dorsum of the hands, on the forehead, nose, and neck. There was also some vesication of the hands, and a sharp demarcation was present between the healthy and reddened skin. The reddened areas became deeply pigmented and later exfoliated; apparently synchronously with the skin symptoms, or, a little later, the nervous symptoms to be noted immediately appeared. The knee-jerks, which had been increased, became absent, the pulse rapid, and the respirations shallow and very frequent. He was given strychnine for these symptoms on May 14, but was not kept in bed, and four days later arsenic was administered for the first time, in small doses of 2 minims of the liq. arsen. three times a day. As it had been suggested that some of the symptoms to be detailed were due to arsenic, it may here be said that he took, in all, only $1\frac{1}{2}$ dr. of the liq. Fowleri throughout, and the neuritis seems to have preceded its administration. All the symptoms improved, the skin becoming completely exfoliated in the pigmented areas, leaving a perfectly smooth white surface, and the boy became so much better that Dr. Clarke was inclined to sanction his bicycling. A second similar but, as regards the neuritis, more severe attack occurred towards the end of May, and the patient was seen for the first time by the exhibitor on May 31, 1914, when the patient, for the first time since his attack of pleurisy in August, took to his bed, where he had remained since then. At this date he had a pulse of 160, respirations between 40 and 50, and was unable to stand up. He had peculiar walnut-coloured pigmentation of the dorsum of the hands, extending from the fingers to about 3 in.

above the wrist on the extensor surface only (Plate I); and there were patches of similar pigmentation on the neck on both sides, on the forehead, and slightly over the nose (Plate II). There was deep pigmentation of the penis, and scrotum and sacral skin. The whole face was flushed and hectic looking. At no time was there any temperature. He was motored up to St. Mary's Hospital a week later, and is at present an in-patient there.

Condition on admission to the hospital: Dr. Wilfred Harris was kind enough to go over the nervous symptoms and reported the presence of multiple peripheral neuritis. There were wrist-drop, foot-drop, palsy of the diaphragm, absence of all deep reflexes except jaw-jerk. Palatal and pharyngeal muscles were not involved. There was general loss of power and tone. The grasp was extremely feeble. There was slight lateral nystagmus, mostly to the left; no cycloplegia; the pupils reacted slowly. Chest: There were no physical signs of tubercle, but some moist sounds at both bases; respirations, 40 per minute, "see-saw" and shallow. Pulse, 156 per minute. The heart sounds were weak and a slight murmur was audible over the tricuspid area. The heart was dilated to right and left. There was œdema of both legs, with pitting on pressure, from the ankle to above the knee; sensation to touch and pin-prick was dulled over the œdematous area. Urine examined on admission showed specific gravity 1015, slightly acid; increased phosphates; trace of albumin; no sugar. Examined June 29: Specific gravity was 1015, and there was much mucous deposit and bacilluria, probably of coli organisms very actively motile; no albumin. A later examination of a catheterized sample showed no bacilluria, so that the latter may have been an accidental contamination. He was given tinct. digitalis 8 minims every four hours, and hypodermic injection of liq. strychninæ 3 minims every four hours.

His weight on admission was 5 st. 9½ lb.; his weight in December, 1912, taken before his illness, is recorded as having been 8 st. 2 lb.

Within a week of admission there was general improvement of the nervous symptoms, and the heart and respiration had slowed down materially. The nystagmus had disappeared. The fundi were normal. Muscle tone was generally better, but he could not stand up.

A lumbar puncture was made on June 12, and half a test-tube of clear fluid was removed for examination. No cells or organisms were found in the centrifugalized fluid. A film had been prepared the day after admission from the blood and showed no organisms, and no abnormality of cells on differential count. The autochrome picture exhibited with the

PLATE I.



Hand of A. B., suffering from pellagra. The picture shows the deep brown pigmentation of the fingers and dorsum with the wrinkling of the skin which precedes exfoliation.



case (Plate II) was taken by daylight on June 12. The pigmentation had become greatly less and much of the brown skin had exfoliated, leaving smooth pink denuded surfaces. Progressive exfoliation had removed, by the time of the exhibition of the case, still more of the characteristic colour. But Dr. Sandwith, who saw the patient at St. Mary's on June 11, when the colour was already less deep than on May 31, when Dr. Little had first seen the case, was convinced of the pellagrous character of the skin symptoms, while doubtful of the significance of the nervous accompaniments. In the great majority of cases reported, the nervous symptoms had implicated the central system, the spinal cord and brain, but in this patient this had at no time been

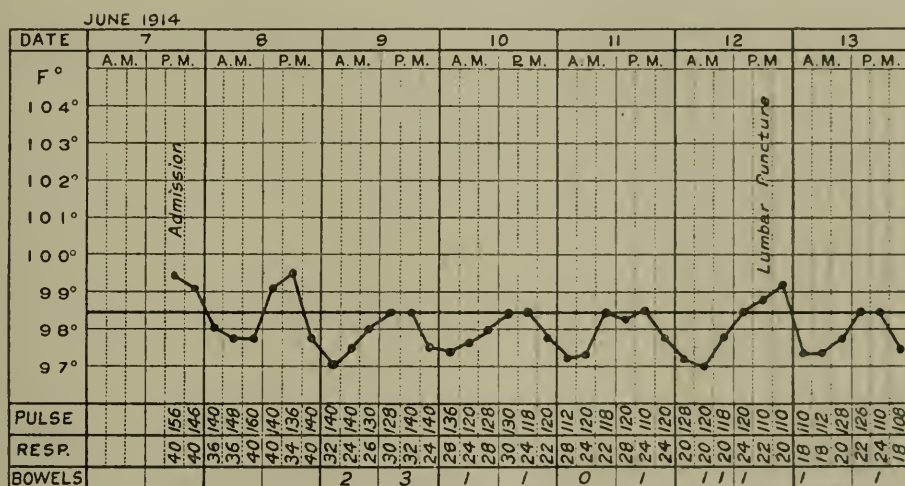


Chart from case of pellagra with skin eruptions.

the case. The presence of peripheral neuritis had been regarded as making the acceptance of the diagnosis of pellagra difficult, but as a matter of fact peripheral neuritis had been reported in numerous cases. Thus, in a series of twenty-seven recorded by Cohoon and Farnell,¹ peripheral neuritis, with foot-drop and muscular atrophy, was present in eight cases. Knee-jerks were absent in fifteen cases, and diminished in five. Kinnier Wilson, examining thirteen cases of pellagra for nerve changes, of which nine were derived from Nyasaland and four from English cases, reports in the first place that the findings in the English cases were identical with those in the African cases. He states that "changes in the peripheral nerves are practically constant and considerable importance must be attached to them. They are often very advanced, and afford evidence of parenchymatous and interstitial

¹ *Boston Med. and Surg. Journ.*, 1913, clxviii, p. 50.

changes in the peripheral nervous system, a reaction to a toxic invasion. It is not easy to determine whether the peripheral nerve changes accompany, precede or succeed the changes in the cord. The effects of the toxæmia appear either simultaneously in the nerves and cord or previously in the former. The histological changes are not those of an infection by blood- or lymph-stream, but bear out the probability of the toxin coming from the abdominal cavity. The morbid agent is probably not a virus, but a toxin, as far as the nervous system is concerned.”¹

In this connexion Dr. Sandwith has been good enough to contribute the following note on the case:—

“The existence of peripheral neuritis does not exclude the association with pellagra, because with the latter disease you may have a great variety of nervous phenomena. The association of a pellagrous rash and of peripheral neuritis, and, what is even more important, the simultaneous clearing up of both the pellagra and the peripheral neuritis, are in favour of both the rash and the nervous symptoms being due to one cause, such as deficiency of nutrition. On the other hand this is somewhat negatived by the statement that he has had extra feeding. It sounds like a case of early tuberculosis, but this need not modify the pellagrous diagnosis, because tuberculosis often occurs in the pellagrous. The two facts in favour of pellagra are the appearance and sites of the rash, preceded by prolonged diarrhœa.”

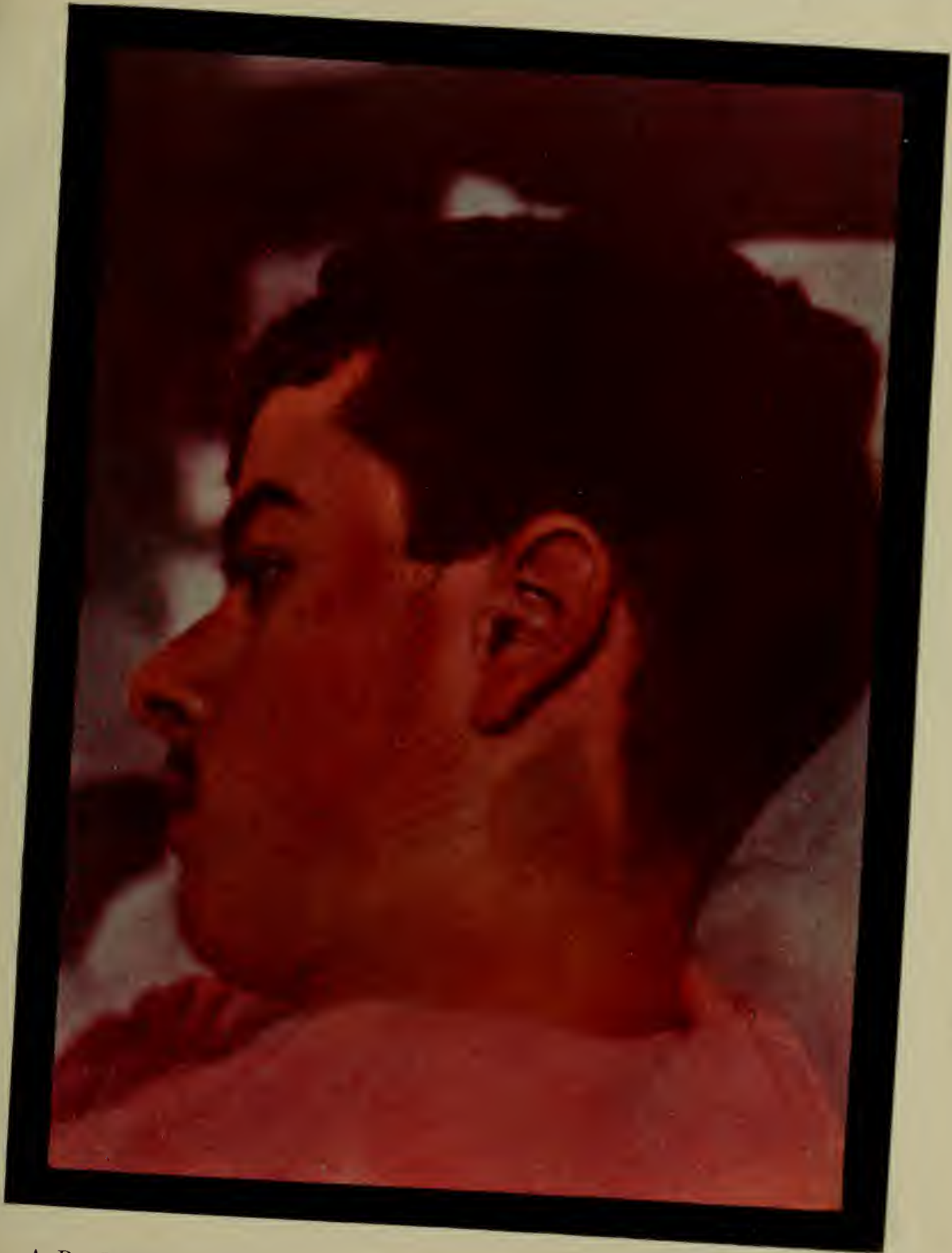
It was difficult to assign any other cause than pellagra for the neuritis in this instance. It had been suggested that drugs might have caused the symptoms, but the prescriptions since April, all of which Dr. Clarke had been good enough to let the exhibitor see, gave no countenance to this suggestion. Dr. Whitfield had felt some difficulty in accepting the skin condition as pellagrous because of the short interval which elapsed between the onset of erythema and exfoliation, but on this point Dr. Sandwith was emphatic in his opinion that early pellagrous eruptions usually disappeared completely within quite a short time, often within three weeks after rest and treatment in hospital.

It was of interest to record that a notable recent browning of the skin of the neck recurred as the result of an accidental exposure of the face to the sun while lying near a window in the ward.

With regard to the cause of pellagra the views held are still too conflicting to offer any practical utility of discussion. The history given

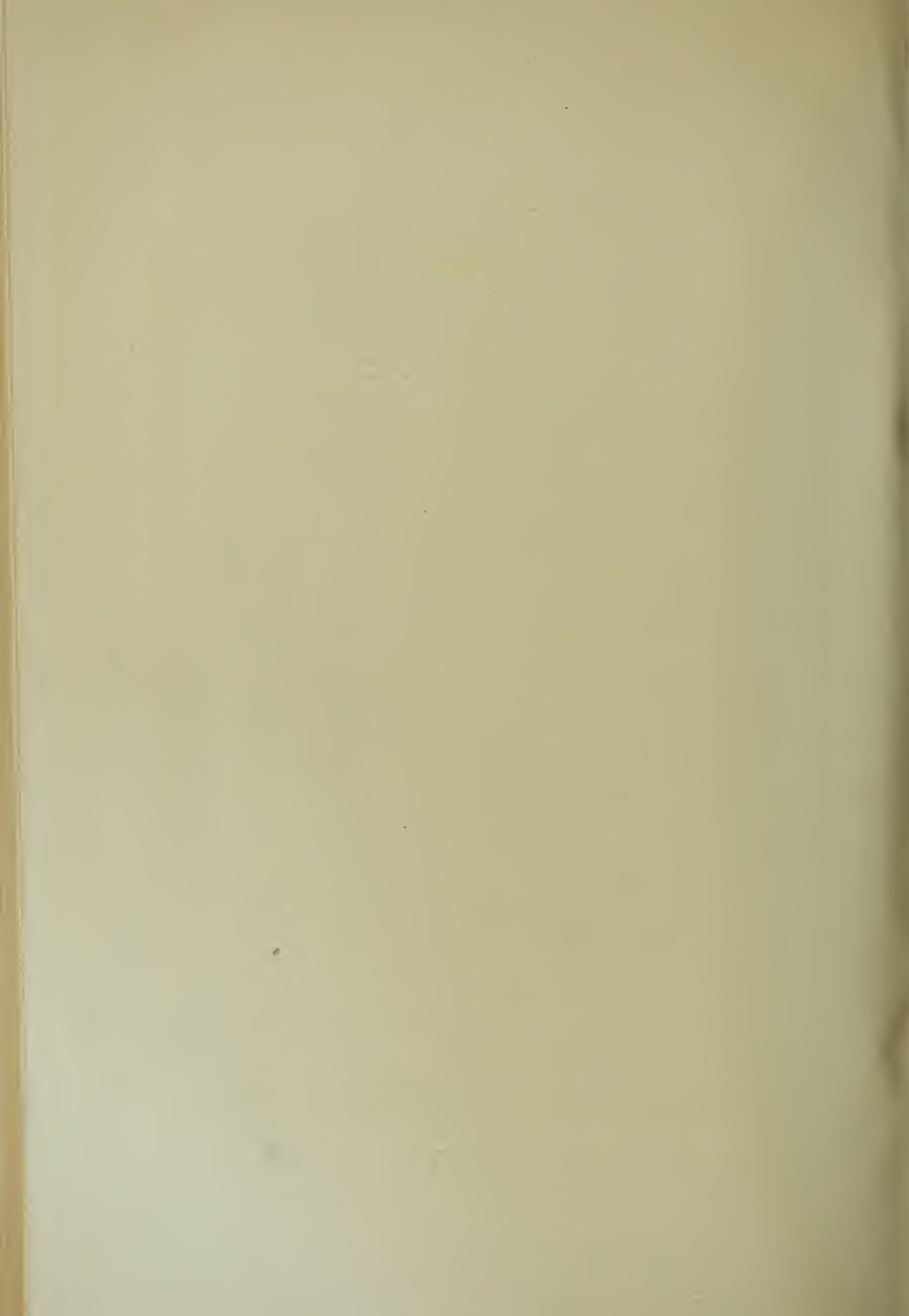
¹ See *Proceedings*, 1914, vii (Neur. Sect.), p. 31.

PLATE II.



A. B. Pellagra. The picture shows the general flushing of the cheeks and forehead, with deep brown pigmentation of the cheeks and back of neck.

LITTLE: Pellagra with Skin Eruptions.



in this case of a bite which ushered in the symptoms rather supports the contention of Sambon that it is the *Simulium reptans* that harbours the parasite supposed to be responsible for the production of pellagra. This fly is found in the vegetation about running water, and is very widely prevalent in Europe. But pellagra has been found established in parts of the United States, where skilled entomologists state that simuliidæ are not found. This fly, therefore, though it may be one host of the supposed parasite, cannot be the only host. The American observers indict another fly, the stomoxys, or stable-fly, of which one species, *Stomoxys calcitrans*, is of almost world-wide distribution; and incidentally it is of interest to note that this species has been accused by two independent sets of observers of being the carriers of the infection of anterior poliomyelitis. In the statistics collected by the Pellagra Commission appointed by the State of Illinois, there was a remarkable preponderance of the disease among women and children, and it was suggested that homekeeping habits fostered the spread of the contagion. Stable refuse, especially when mixed with horse dung and urine, is a favourite breeding ground for *Stomoxys calcitrans*, and the probability of finding these conditions in the neighbourhood of dwelling houses of the poorer population may explain the incidence in home-dwellers rather than in workers in the field. I have not been able to find any positive evidence of a bacterial cause for pellagra; the nearest approach to it is an observation by W. H. Harris, who, using a filtered virus derived from a human subject, inoculated two monkeys with it. The virus was recovered from these two monkeys and transmitted to a third, and each of the three monkeys developed all the intestinal, dermatological, and nerve evidences of pellagra. The hypothesis which ascribes pellagra to an effect of malnutrition, or to the consumption of rotten maize, seems to be losing ground. This possibility was at any rate absent in the case just recorded. The Illinois commission conducted a lengthy experiment, with uniformly negative results, with monkeys fed on healthy and rotten maize. Results were also negative with monkeys fed with faecal matter excreted by pellagrins and with monkeys inoculated with tissue emulsions and body fluids of pellagrins.

No further information could be obtained about the initial bite, but it was of great interest to learn, on the authority of Dr. Winkelried Williams, who had seen the present patient, that a case of quite definite pellagra had been admitted into the Sussex County Hospital last summer, which came from Horsham, only twelve miles from Horley. The suggestion that the boy, although in comparatively comfortable

circumstances, had been ill-nourished, could not be sustained, and the dietary excluded in particular the possibility of assigning the eating of maize as a cause. Dr. Little believed this to be the first certain case of pellagra to be shown at any medical society in London and every effort would be made to prosecute the study of the patient while he remained in St. Mary's Hospital.

DISCUSSION.

The PRESIDENT said the Section must be greatly indebted to Dr. Graham Little for bringing the case forward; and, personally, he thought the diagnosis was established on good grounds. He was under the impression that peripheral neuritis had been noted in several cases reported in America.

Dr. SEQUEIRA said that recently he had had under his care at the London Hospital a man whose case puzzled him very much. He admitted the patient with the diagnosis "? pellagra." He had the skin conditions associated with that disease, as well as tremors, wasting, depression, and melancholia. He also had diarrhoea. The eruption improved so rapidly in hospital that there was nothing tangible to show at a meeting. Under arsenic, with rest in bed and ordinary feeding, he quickly put on weight, and he had now left the Hospital, though he was being watched. He came from Essex, not far from London. (Since the meeting, Dr. Sequeira has admitted into his ward another case, a little girl. Dr. Box has seen the patient and confirms the diagnosis of pellagra. The symptoms are acute wasting, with the characteristic cutaneous phenomena.)

Dr. G. PERNET said his experience in connexion with living cases of pellagra was small, but at the International Dermatological Congress at Rome he had seen, mainly thanks to Dr. Sambon, a good many cases, especially at a pellagrous village not far from the capital. He considered that Dr. Graham Little was justified in regarding the present case as one of pellagra. Climatic and other national conditions must be taken into account. The present patient was "white" in comparison with Italians. The difficulty would be to diagnose early native cases here in England. He had a case of pellagra at present under observation in his wards, but the patient was too ill to be moved. The patient at one time had lived in the same district as the case recently under Dr. Box at St. Thomas's Hospital.

Dr. MACLEOD said that he had seen a number of cases of pellagra in the Campagna, near Rome, a few years ago, and it had been pointed out to him that pellagrins exhibited an abnormal sensibility to sun and that the slightest exposure was liable to determine an attack of dermatitis. He wished to know if this symptom had been observed in the present case. This fact had even

been taken advantage of for diagnostic purposes in cases where the cutaneous symptoms were not well marked and the concomitant gastro-intestinal and nervous symptoms were vague. With regard to the fact that the skin appeared to have recovered completely in this case, he did not consider that that was in any way against the diagnosis of pellagra, because recovery was quite possible in mild attacks; but if the attacks were severe or frequently repeated, permanent changes in the texture of the skin and signs of chronic dermatitis were invariable. He was inclined to agree with Dr. Little in his diagnosis of pellagra.

Dr. WHITFIELD said he thought that the circumstance of the bite could not be used as an argument on both sides. They would be illogical to use the bite as an argument in favour of the diagnosis of pellagra and also to assume that the case was one of pellagra, and to use the bite as an argument in favour of Dr. Sambon's theory. Dr. Whitfield knew little about pellagra, but in discussing a doubtful case with Dr. Sambon he had received the impression that the erythema of pellagra did not pass away as quickly as it had done in this case.

Case of Trophœdema.

By E. G. GRAHAM LITTLE, M.D.

THE patient was a young girl, aged 16, with persistent œdema and adiposity of the lower extremities from the level of the groin to the ankle. When first brought to the skin department at his hospital she had a general erythema of the skin of the leg, a symptom which recurred when she was up for any length of time, but receded when she was kept in bed, as she had been for some weeks. The history given was interesting. She had fallen off a cliff, 30 ft. high, three years ago. She had fallen on her feet, and was not rendered unconscious by the fall, but there was much bruising and pain in the legs. She was kept in bed for three months after the accident, and since then had constantly complained of pain and aching in the legs, which had swelled whenever she was about. The symptoms of acute pain have increased, especially in the past three or four months, and she gets easily tired. The diagnosis at first made by the exhibitor was that of Milroy's disease or trophœdema; the likeness of the case to some cases reported under that title by Hope and French in the *Quarterly Journal of Medicine*, April, 1908,¹ being the ground for making the diagnosis. Since her admission to the hospital other investigations had suggested another possibility, which had chiefly been worked out by the Medical Registrar

¹ *Quart. Journ. Med.*, 1907-08, i, pp. 312-330.

to the hospital, Dr. Castellain, who was preparing a thesis for his Cambridge degree on disorders connected with the ductless glands, and to whom Dr. Little wished to express his best thanks. The second possibility suggested by these findings was that of a hypopituitarism, the supposition being that the hypophysis cerebri may have been injured by the fall, which appears to have been the starting-point of the symptoms. The present state of the patient will be described, and these alternative diagnoses then discussed. The figure, as far as the level of the hips, was that of a well-developed though not especially obese young woman, but abruptly from the hip the limbs were seen to be enormously swollen, the swelling consisting partly of fat and partly of of a hard, brawny œdema extending from the hips to the ankles, and more marked in the lower part of this area. The feet did not appear swollen, the œdema ceasing at the ankles. The skin, over the legs especially, was coarse and rough, and at the lower third of the legs there were some permanently dilated capillaries; both legs, as has been said, become flushed when she has stood for some time.

Measurements were taken before and after the patient was exercised in walking or standing for two to three hours, with the following results:—

				June 4, 1914						July 9, 1914	
				In bed	After exercise					In bed	After exercise
				In.	In.					In.	In.
Waist	...	...	...	25	25 $\frac{1}{4}$	...	25	...	25	25	25
Right thigh	...	...	...	23	23 $\frac{1}{4}$	...	22	...	22 $\frac{3}{4}$	22 $\frac{3}{4}$	22 $\frac{3}{4}$
Left thigh	...	...	...	23 $\frac{1}{2}$	23 $\frac{1}{2}$	...	22 $\frac{1}{2}$	...	23	23	23
Right calf	...	...	...	15	15 $\frac{3}{4}$	...	14 $\frac{1}{2}$	...	15	15	15
Left calf...	...	...	...	15 $\frac{1}{4}$	15 $\frac{7}{8}$	...	14 $\frac{1}{2}$	...	15 $\frac{1}{2}$	15 $\frac{1}{2}$	15 $\frac{1}{2}$
Right ankle	...	...	...	9 $\frac{1}{2}$	10 $\frac{1}{2}$	...	9 $\frac{1}{2}$	...	9 $\frac{3}{4}$	9 $\frac{3}{4}$	9 $\frac{3}{4}$
Left ankle	...	...	...	9 $\frac{3}{4}$	10 $\frac{1}{2}$	...	9 $\frac{1}{2}$	...	10	10	10
Right arm	...	...	...	10 $\frac{1}{2}$	10 $\frac{1}{2}$	...	9 $\frac{1}{2}$	...	9 $\frac{3}{4}$	9 $\frac{3}{4}$	9 $\frac{3}{4}$
Left arm	...	...	...	10 $\frac{1}{2}$	10 $\frac{3}{4}$	...	9 $\frac{1}{2}$	...	10	10	10
Neck at level of thyroid	...	...	...	12 $\frac{1}{4}$	12 $\frac{1}{4}$	...	12 $\frac{1}{2}$	...	12	12	12

With the exception of the pain in the legs and thighs, which was fairly continuous, she had no discomfort when lying in bed. She did not give the least impression of a myxœdematous aspect, and there was no abnormality to be detected of thyroid, thymus, or lymph glands. She was said to sleep somewhat heavily, but was not dull or slow in speech or act. She has had frequent headache of frontal or retro-ocular type for five or six years. Menstruation commenced at the age of 14, but has always been scanty, lasting only two days, and coming at irregular intervals, usually of fourteen days. The hair on the scalp

was not exuberant, but was quite normal, and did not have the lifeless aspect of myxœdematous hair. The pubic and axillary hair was normal. There were no abnormal signs in abdomen or chest. The systolic blood-pressure, tested soon after admission, was 116, the pulse full and regular, the blood-vessels normal. The urine was normal in quality and quantity,

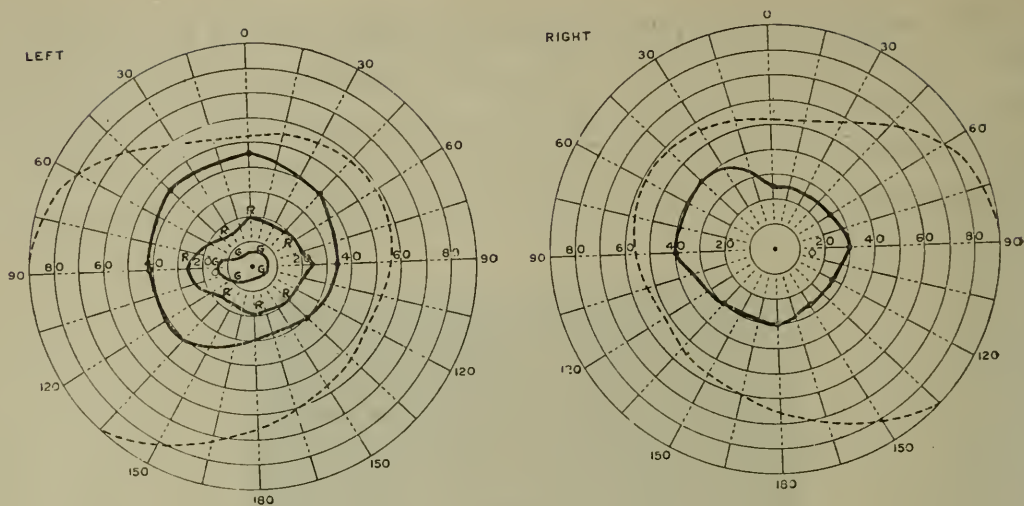


FIG. 1.

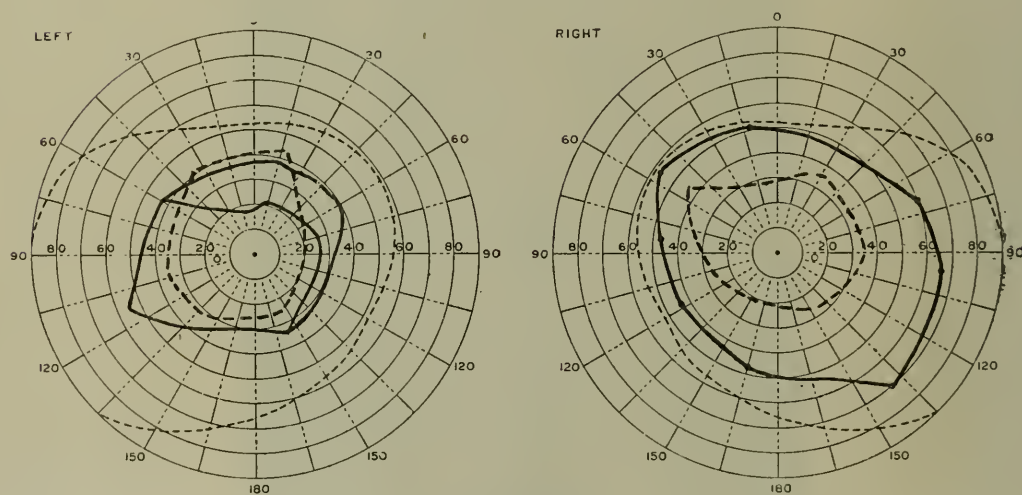
Case of trophœdema. Note the swelling of the lower limbs, from groin to malleolus, ceasing at ankles.

and there was no polyuria or unusual thirst. Her weight on admission was 9 st. $4\frac{3}{4}$ lb.; after a month in bed, 8 st. $12\frac{1}{2}$ lb.

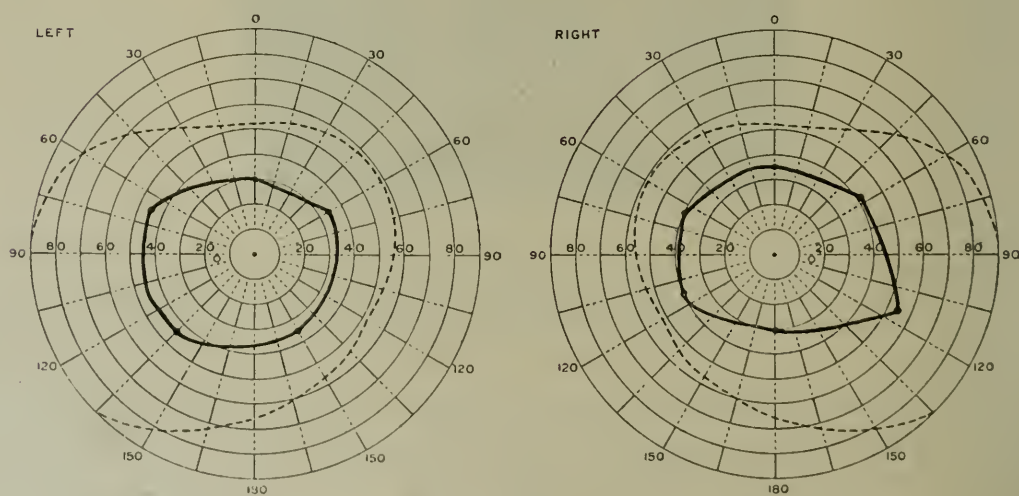
Family history: In French's cases (and the photograph figure of his first case is curiously like the present patient) there was a strong history of inheritance of the peculiar œdematous condition. There is



White, red and green light.



White light.



White light.

Perimeter charts, taken June 23, 1914.

no such history in the case now recorded. The father and mother and the two sisters are healthy, but a maternal aunt is said to be the subject of diabetes mellitus.

Ophthalmic examination: No diplopia or nystagmus, pupils react well. Disks and fundi normal. The fields on both sides were curiously restricted and variable, the latter quality suggestive of functional rather



FIG. 2.

Showing enlargement of sella turcica.

than pituitary causation. Refraction $\frac{6}{34}$ with +9; $\frac{6}{3}$ with -9 (both eyes the same).

The patient's sugar toleration was tested on several occasions. She was able to assimilate 10 oz. of glucose, but the urine showed a slight reduction with 12 oz. of glucose.

A remarkably good skiagram was obtained of the skull, and on

comparison of the appearances of a normal skull of much the same general size, as tested by superposing the plates one over the other, the sella turcica in the patient seemed undoubtedly enlarged.

The patient's temperature had been uniformly below 98° F. (usually 97.4° F.) up to the time at which a small dose of thyroid extract was given (1½ gr. bis die); during the four days that this had been tried the temperature within twenty-four hours of administration had risen and was maintained a degree above the normal level of her temperature while in the hospital in the past four weeks. The pulse rate which averaged 68 in the same period had also risen, as was to be expected with administration of thyroid. The fact that thyroid extract can to some extent replace deficient pituitary secretion has been noted

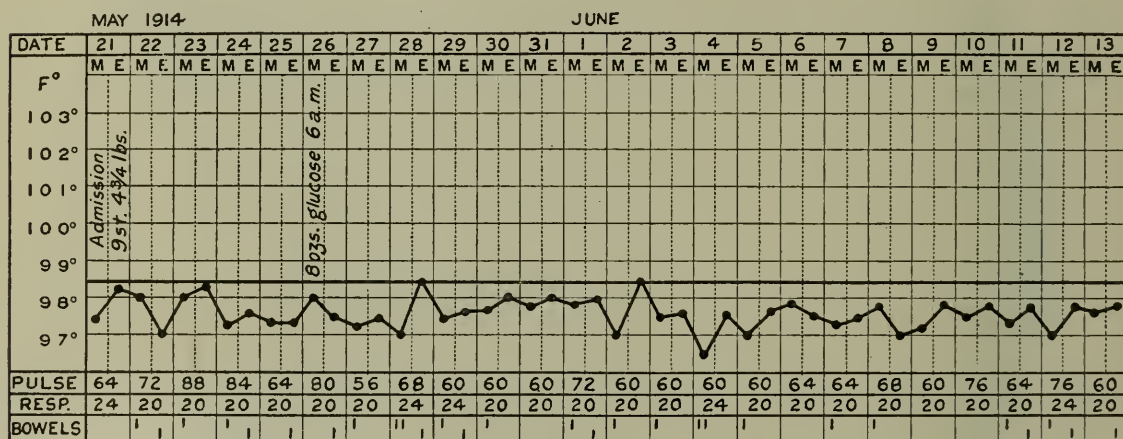


Chart showing continued subnormal temperature.

by Cushing, who has also experimentally raised subnormal temperatures by pituitary therapy. The experiment of thyroid administration is as yet of too short duration to warrant any deductions being made.

The symptoms may thus be summed up as follows: Frequent headache, frontal and retro-ocular. Menstruation scanty, irregular, and tending to be too frequent (fourteen days). Obesity especially obvious in, if not wholly confined to, the parts below the hip. Œdema (increased by standing up) chiefly in the lower part of the lower extremity and ceasing abruptly at joint levels, the ankle and hip (this was notable in French's cases). Average temperature, 97.4° F., raised after taking thyroid. Mental powers normal. No trace of myxœdematous slowness of reaction. Central nervous system normal. Normal blood-pressure and cardio-vascular system. Perimeter examinations show restricted

fields, with considerable variations in fields taken at different times on the same day. No pigmentation or asthenia. No deficiency or hyperplasia of thyroid, thymus, or lymph glands. Urine normal. Increased sugar tolerance. No polyuria or excessive thirst. No evidence of disordered function in lungs or alimentary system. Skiagrams of skull indicate presence of enlarged sella turcica, as compared with normal skull of approximately same size. History of initial trauma which may have damaged the hypophysis cerebri. A symptom, prominently present and difficult of explanation, is the frequent and considerable pain confined to the lower extremity.

DISCUSSION.

Dr. SEQUEIRA said his colleague at the London Hospital, Dr. Cecil Wall, had a case of similar type. It followed a fracture of the base of the skull.

Dr. DOUGLAS HEATH asked whether any other member of the family was similarly affected. He had a case which he regarded as of the same nature in a young man, and one or two other members of the family were similarly affected. The disease came on at the fifteenth or sixteenth year in all, and there was swelling and marked coloration of the feet and legs in each member of the family attacked by the œdema.

Dr. SEMON asked whether the possibility of myxœdema had been considered in this case. In some respects it was suggestive of that; loss of hair and œdema, for instance. It was difficult to make sure of the size of the thyroid by palpation, and he would like to know if the therapeutic result of feeding with thyroid extract had been or would be tried in this case.

Dr. PERNET asked whether the Registrar referred to had suggested any relationship to *adipositas cerebialis*, which was a disease connected with the pituitary body. He knew of the condition known as *familial trophœdema*, which Meige and others had written about. In a case of *adipositas cerebialis*, he had had the opportunity of cutting sections from the skin of the thigh. He had found not only marked adiposity, but the derma itself was thickened.¹ He had suggested *dermo-adipositas cerebialis* as more applicable.

¹ Pernet, "Adipositas Cerebialis," *Trans. Amer. Derm. Assoc.*, Philad., 1909, p. 27.

Favus in a Mouse.

By E. G. GRAHAM LITTLE, M.D.

A CASE of favus in a mouse which had been caught in the room occupied by a child, shown at the Dermatological Section last February, with typical favus of the neck. The room was above a mews and was occupied by the parents and three children, only one of whom, the eldest, had contracted the disease. There were kept in the room, in addition, a number of canaries which were bred by the father as a source of profit, and at first it seemed likely that the birds were responsible for the infection, especially as some of them were apparently in very poor feather. An examination of the plumage had proved negative, however, and as the *Achorion quinckeanum* in pure culture had been grown from the patch on the neck, it seemed more likely that mice might be the cause. This had now been proved to be the case. The mouse shown had three large patches of typical favus, on the mandible, head and back. The patch on the child's neck had shown very characteristic yellow scutula, and the culture had given the first indication that an unusual type of achorion was concerned.

Favus in Mother and Child.

By GEORGE PERNET, M.D.

THE child, a girl, aged 2, was brought to the West London Hospital for crusting about the scalp, which had been going on for about one year. All kinds of applications had been used. The scalp was crusted generally over the greater part of its area; the crusts were yellowish in colour, and favus was diagnosed. This was confirmed by microscopical examination, the scrapings revealing mycelia and spores in great quantity. There were no typical scutula. It was found that the mother was also suffering from a scalp affection, and on examination typical scutula were found in her, as well as sulphur-yellow crusting over the greater part of the scalp. The fungus was also demonstrated in her case. She was a woman, aged 33, and the disease had been present from the age of 2, that is, for thirty-one years. Both cases had been

X-rayed since, and suitable local treatment ordered. The hair was coming out freely in both mother and child. No other members of the family were affected according to the mother's statement. Both mother and child were English, and came from West Middlesex, but the mother originally came from Bucks. Dr. Elworthy, Pathologist to the West London Hospital, had cultures in preparation, and Dr. Pernet hoped to show them at the next meeting.

DISCUSSION.

Dr. PERNET added that he would bring the cultures, but up to the present time they were not violet.

Dr. ADAMSON said he had shown a case similar to Dr. Graham Little's about six years ago, of a baby with a recent patch of favus on the face, and a mouse with favus caught in the room in which the baby slept on the floor. Cultures of *Achorion quinckeanum* had been obtained from the lesions of the baby and of the mouse. Three kinds of favus had been cultivated from infected mice: *Achorion quinckeanum*, *Achorion schönleinii*, and *Achorion violaceum* (by Bruno Bloch). Only the first of these had been found in mice in this country, and it was not uncommon for human beings to become infected by this type of mouse favus. He (the speaker) had exhibited three cases, and Dr. MacLeod and Dr. Bolam had shown others. The lesions in the human being were single, ringworm-like patches, with one or several scutulæ or even without scutula, and in no case reported had the hair been infected. There seemed, therefore, no danger of human beings becoming the subjects of favus of the ordinary type, such as those shown by Dr. Pernet, by infection from mice. This was a practical point, because otherwise it would seem hopeless to try and stamp out human favus by isolation and X-ray treatment, as was now being attempted in London with apparent success.

The PRESIDENT said that cases of favus in purely British subjects were much more common than was previously supposed. He could not account for the notorious frequency of the disease in Scotland.

Dr. SEQUEIRA reminded members of the celebrated case which Sir Jonathan Hutchinson and Dr. Stephen Mackenzie showed at the Dermatological Society of London—a boy with favus of the tongue, a picture of which was in the Royal College of Surgeons Museum. That case came from Camborne, Cornwall.

Case of Bullous Ichthyosis.

By GEORGE PERNET, M.D.

THE patient, a young man, aged 18, a frame-maker, first came under the exhibitor's observation last May, though he had been attending the West London Hospital from the age of 6, on and off, for blistering of the skin. When seen a month ago, the lower part of the right forearm was red and desquamating, and on the back of the right hand there were the remains of a large bullous lesion with coarse separation of the epidermis. This had commenced as a blister the size of a penny on the lower part of the right forearm, and had rapidly extended downwards on to the back of the hand. Smaller bullæ were found scattered about the left forearm, and a small one on the left elbow. Over the lower part of the spine there were areas of pigmentation, and slight scaliness and atrophy about the sacrum and adjacent parts of the buttocks. There were raised, dirty-looking, rough ichthyotic circular areas over the elbows; and on the front of both knees two or three large areas as above, with smaller thickened ichthyotic ones scattered about, with a tendency to spread down the legs. About the knees and legs there were purplish areas of old bullæ which had occurred two months previously. The fingers and nails were unaffected and the patient repeatedly stated that the blistering was not the result of rubbing or injury, though to-day he had a blistering lesion on the thigh which had occurred after an injury. The palms were not affected, nor did they present the characteristics of ordinary ichthyosis. The skin of the face was normal.

The case did not fit in with epidermolysis bullosa, but no doubt had connecting links with that condition. According to the patient, his father and his three brothers suffered from the same condition, but the contributor had not yet been able to see any of them. If he did he would report in a clinical note. He considered the case came into the category of what had been termed by Besnier, and also by von Düring, "*Ichthyose à poussées bulleuses*" and also perhaps of what Brocq had described as "*Erythrodermies congénitales ichthyosiques avec hyper-épidermotrophie avec bulles.*" He referred to a paper he had contributed on the subject of "*Bullous Ichthyosis*" in 1911,¹ where further

¹ Pernet, "*Bullous Ichthyosis*," *Brit. Journ. Derm.*, 1911, xxiii, p. 344.

details would be found. The ichthyosis in this case was not ordinary ichthyosis, but came into the category of nævus in the wider sense—viz., a congenital defect. In the young man shown the bullæ certainly appeared to arise spontaneously, and he considered they were not of the nature of ordinary pus infection lesions in origin, though secondary infection occurred rapidly. Any question of dermatitis artefacta he had gone into, and considered that could be decidedly put out of court.

DISCUSSION.

The PRESIDENT said he presumed that Dr. Pernet included hystricismus under the general term of ichthyosis, as the case exhibited was an example of the former rather than of the latter condition. He had never seen either associated with recurrent bullæ, which, he suggested, might be the results of pus infection.

Dr. ADAMSON said he thought the condition was a zoniform or segmental nævus, and was possibly associated with epidermolysis bullosa; often two congenital defects went together. But against the diagnosis of epidermolysis was the fact that the patient did not appear to get the blisters on the fingers, and he asked whether the bullæ might not be impetiginous.

Paget's Disease of the Nipple.

By J. L. BUNCH, M.D.

THE patient, a woman, aged 51, first noticed some inflammation and redness around the left nipple fifteen months ago. This redness gradually extended and the nipple became sore with a slight watery discharge at times. When first seen a fortnight ago, there was an area of redness extending for $\frac{3}{4}$ in. around the nipple; the nipple itself was wanting in prominence and was definitely indurated, while the inflamed area was slightly scaly and showed some signs of infiltration. There was no enlargement of the axillary glands and the patient did not complain of any pain. Sections showed a downgrowth of cells of a squamous, as opposed to a columnar, type. A massive dose of X-rays was therefore administered with a very hard tube, with a filter of aluminium 1 mm. thick, and the redness and infiltration had since undoubtedly greatly diminished. A second similar dose of X-rays had been administered the day before the meeting and the only question which now arose was whether it was justifiable, in view of the

undoubted benefit which had followed the first dose of X-rays, to continue this treatment.

He brought the case forward in order to obtain the opinion of the members as to whether his suggestion of amputation must not be urged very forcibly.

DISCUSSION.

The PRESIDENT said that, presuming the patient's aversion to surgical ablation of the breast to be insuperable, he would suggest the use of massive doses of radium in tubes inserted deeply through the base of the growth if a sufficient quantity of radium could be obtained. He had met with one apparently successful similar case.

Dr. SEQUEIRA said he had seen such disastrous results from the treatment of this condition by X-rays and radium that he feared methods other than surgical even hastened the patient's end. In many of these cases he felt sure that duct carcinoma was already established. Dr. Whitfield had described a case of Mr. Lenthal Cheate's in which, early in Paget's disease, there was a growth right into the substance of the breast. He considered that the correct treatment was early and complete removal. Sir Malcolm Morris's case of Paget's disease at the umbilicus did well, he believed, by X-ray treatment, but he had not seen another favourable case.

Dr. STOWERS said that he had recently seen a similar case treated with radium, but the result was most unsatisfactory. In spite of the natural reluctance of this patient to lose her breast, he was satisfied that her best chance of recovery depended upon immediate removal by operation. He exhibited a colour drawing of a case which he showed to Sir James Paget himself in 1882 which was typical in character, the patient eventually dying of malignant disease of the mediastinum. A special feature in his case was that the patient had previously been operated upon for scirrhus of her other breast.

Dr. HALDIN DAVIS said he had had a case of Paget's disease of the nipple, of which the appearance was similar to that in Dr. Stowers's drawing. It was treated with radium by Mr. Hayward Pinch, at the Radium Institute, and it was successful in so far that the patient died of another disease about nine months afterwards; but after death a lump was still present lying beneath, which he did not doubt was carcinomatous; she also had an enlarged axillary gland on the diseased side. Her death occurred in an institution from cerebral hæmorrhage, and as he did not learn of it until some time afterwards, he could not arrange a post-mortem examination. After that experience, he would not like to recommend non-surgical measures for any similar case.

Dr. NIXON (Bristol) did not think cases of Paget's disease of the nipple should be regarded as dermatological at all. He once was a near participant in a tragedy of the kind, and he had known of others. Most of these cases had a very malignant form of duct carcinoma, and the patients should be urged to have early excision done. If that were firmly declined, and only then, the palliative measures, X-rays or radium, should be suggested. The superficial improvement after the application of these agents only served to give the patient a feeling of false security, which constituted the greatest tragedy of all.

Dr. MACCORMAC said he agreed that two distinct types of carcinoma passed under the name Paget's disease: the squamous, and the spheroidal celled; the result of the treatment depended on which form was being dealt with; in the latter the tendency to metastasis was marked, in the former but slight, and it was only in the squamous variety one could expect much good from radium. In reply to the President's question, he did not think Paget's disease often came into the cancer wards of the Middlesex Hospital, but he had no definite knowledge on this point.

Postscript.—The breast was removed on Dr. Bunch's advice a few days after this meeting.—J. L. B.

Case of Psoriasis associated with Thrombosis of the Inferior Vena Cava.

By J. L. BUNCH, M.D.

THE patient, a male, aged 33, presented a number of lesions of typical psoriasis, which had been present, he stated, on and off in varying positions for a good many years. Certain superficial veins of the abdomen, groin and legs were very considerably dilated, mostly tortuous, and in places as large as a forefinger. The legs had to be kept bandaged as high as the knee; otherwise they swelled until their circumference measured 30 in., or more, and pitted very deeply on firm pressure. Patient had never had scarlatina or any other contagious fever, or, to his knowledge, any illness, except the psoriasis and the thrombosis of the inferior vena cava. The history he gave was that some three years ago, after over-exertion in running, he lost the use of his lower limbs and was admitted to one of the largest London hospitals. One of his legs was swollen. Some months afterwards the other leg began to swell, and soon afterwards the superficial veins of the abdomen and groin increased very considerably in size. At the present moment the chief inconvenience to the patient is caused by the necessity of

keeping the legs bandaged and the discomfort of the venous swelling in the groin.

So far as concerned the skin lesions it was a straightforward case of psoriasis. The patient had obvious thrombosis of the inferior vena cava, which apparently dated back three years, whereas the psoriasis preceded that by a considerable time. It had been suggested that there was some direct relation between the two diseases, but Dr. Bunch did not agree with this.

Dr. STOWERS thought the conditions were merely coincidental.

Case of Lichen Planus Atrophicus.

By J. M. H. MACLEOD, M.D.

DR. J. M. H. MACLEOD showed a case of lichen planus atrophicus in which the lesions were arranged in a reticulate fashion corresponding to the superficial venous network. The patient was a man, aged 22, occupied as a porter. He was somewhat fragile-looking, highly neurotic, and suffered from headaches and giddiness, the exact cause of which was uncertain. There was no organic disease present, nor was there any history or evidence of syphilis or tuberculosis.

The reticulate eruption was situated on the inner surface of the left knee, and occupied an area about the size of the hand. It began about twelve months ago, and was noticed first as a number of small red spots, the exact characters of which the patient did not observe. These kept on coming out, and coalescing in such a manner as to form a network enclosing areas of apparently healthy skin.

When the case was demonstrated there was a brownish network corresponding to the area of distribution of the superficial veins. Here and there small angular atrophic lesions of a brownish-purple tinge, and characteristic of lichen planus atrophicus, were noted over it, but the greater part of it showed no evidence of atrophic lesions. The network enclosed islets of skin which appeared to be de-pigmented, as if the pigmentation had taken place in the network at the expense of that in the enclosed areas, in the same way as sometimes occurs in melanoderma. In front of the opposite knee there was a group of lesions of lichen planus, but there were no corroborative lesions in the mucous membrane of the mouth.

The case was of interest owing to the difficulties it presented at first sight in diagnosis, and the relation which the lichen planus lesions appeared to have to the venous network in determining their distribution.

DISCUSSION.

The PRESIDENT pointed out that in a corresponding position on the opposite side there were a few typical lesions of lichen plano-pilaris, which strongly tended to confirm Dr. MacLeod's diagnosis.

Dr. ADAMSON considered it was an example of the lichen plano-pilaris of Dr. Pringle; the pilaris on the other side helped this diagnosis. The interesting feature was the distribution. Dr. Colcott Fox had pointed out that lichen planus had often a curious network distribution, and he (Dr. Adamson) thought the network was produced by the fact that the lesions followed the network of livedo. This case seemed to confirm that view.

Adenoma Sebaceum.

By W. KNOWSLEY SIBLEY, M.D.

THE patient was a brunette, aged 19, of normal mental and physical development, and had never had any serious illness. The father was living, but had to retire from business at the age of 50 on account of a nervous breakdown; the mother was living and well. The patient was the youngest of nine children, who were all strong and well. There was no family history of mental or physical disease.

The lesions, which were situated on the face, had been noticed since childhood. They remained fairly stationary for some years, but appeared to increase in size and numbers a year or two ago. The lesions were situated on both cheeks, sides and front of the nose, upper and lower lips and chin, the forehead being unaffected. They consisted of small, raised papules, varying in size from a pin's head to a large sago grain. Some of them had a pale, semi-translucent, rather waxy appearance: others were markedly red and vascular, being covered by telangiectases. The appearance of the lesions varied considerably from time to time. On flushing, they became much more prominent, and the patient stated that they had often ruptured and bled with the slightest irritation. Some of them disappeared on pressure, others remained constant. There was slight seborrhœa capitis, but no acne or comedones were present on the face, nor had any of the lesions been pustular. A fairly large group

of flat, fibromatous, non-pigmented nævi were present in the middle of the lumbar region. Two other similar nævi were present over the lower left ribs. A small, pigmented nævus was present on the left cheek, and another on the abdomen, and several minute ones on the arms.

The lesions were not nearly as conspicuous as they were a short time ago, as I had treated several of the larger ones with electrolysis.

The first case in this country of this somewhat rare disease was shown by our President and described in the *British Journal of Dermatology* of 1890, under the name of "congenital adenoma sebaceum." Krzyzstalowicz describes four types of this disease: (1) Caspary's sebaceous tumour; (2) Pringle's sebaceous angiomatous and fibromatous mass; (3) Darier's angiomatous structure—vascular and warty nævi; and (4) Perry's sweat-gland, nævus type.

Dr. Sibley added that he considered his case was rather of the type described by Darier; there were more telangiectases about it than where the sebaceous glands only were involved. When the patient flushed it was markedly characteristic, the lesions becoming very red and prominent.

Report on Section.—The section showed a slight thickening of the stratum corneum, the stratum granulosum was well marked, and there was also hypertrophy of the stratum papillæ. The sebaceous glands were very much enlarged, some of them containing small cysts, the blood-vessels were dilated, and there seemed to be an increase of the fibrous tissue elements; there was also some cellular infiltration.

The PRESIDENT said the present case was a good example of one type of adenoma sebaceum with which his name had been associated, although but little credit was really due to him. When he wrote his article on the subject in 1890 he obtained all his information from French sources, and he made no claim whatever to priority of observation. The original cases by Balzer and Ménétrier were published in the *Archives de Physiologie* for September, 1885, and these authors were responsible for the nomenclature which he had adopted. There were now a considerable number of cases on record in which there were no mental peculiarities or deficiencies. The patient exhibited had not got the commonest form of concomitant nævoid growth on the trunk and buttock; these were usually bigger, softer, more cushion-like and less nodular. He entirely concurred in the modern view that the condition was a sebaceous nævus and he considered that the name "adenoma sebaceum" would soon cease to be in current use.

Case of Leiomyoma (? Epitheliomatous).

By J. H. SEQUEIRA, M.D.

THE patient, a young woman, aged 32, came to the London Hospital complaining of a number of tumours on the forehead. They had been present as long as she could remember, and she gave the history that the lesions swelled up and were more painful in the winter. They had been giving her more trouble during the last few years. The family history was unimportant.

There was a collection of small, rounded, pink growths on the right side of the forehead and on the right cheek, as low as the angle of the jaw, and extending forward under the right eye as far as the nose. The lesions on the forehead were of a pinkish-red colour, while those on the cheek and side of the face were nearly the same colour as the surrounding skin. The lesions were small rounded elevations beneath the skin, varying in size from a millet seed to a small pea. The patient gave a definite history of the lesions being painful and tender, especially during the colder months of the year. In the left side of the neck there were also groups of lesions similar to those on the side of the face, none of them exceeding a millet seed in size, and all of them (or nearly) of the same colour as the surrounding skin.

Histology: One of the tumours was removed for microscopical examination, and Dr. Turnbull furnished the following report: "Section of skin of forehead showing stratified squamous epithelium with some hair on surface. In the dermis immediately beneath the epithelium is a myomatous nodule consisting of many small bundles of unstriated muscle interlacing with fine bundles of collagen fibre. These are situated round a hair-root, and the growth appears to arise from one of the arrector muscles."

An interesting point in the case was the unilateral arrangement of the growths, the area involved being accurately limited by the middle line of the forehead and nose. The history that the lesions had been noticed from the patient's childhood, together with the unilateral distribution, naturally suggested the possibility of nævoid origin. The only point which appeared to the exhibitor to be against this was the fact that the patient complained of pain. It is recognized that leiomyomata are painful, and that this feature distinguishes them from many other forms of skin tumours, but it is unusual to find congenital

growths, even of the nerves themselves, painful. The number of lesions precluded any operative treatment, which would necessarily have been very extensive and would have involved practically one half of the forehead and the cheek.

DISCUSSION.

The PRESIDENT remarked upon the marked involvement on the right as compared with the left side. He had never seen so abundant a growth of leiomyomata, the diagnosis of which was facilitated by the marked tenderness on pressure.

Dr. ADAMSON said the unilateral distribution was very interesting, and brought it into the category of zoniform nævi. Dr. Whitfield's case was unilateral in the distribution of the supra-orbital nerve, and Dr. Wallace Beatty's case unilateral on the face and symmetrically bilateral on the chest.

Dr. MACLEOD said he showed a case in a woman five years ago. It was on one side, extending from the middle of the cheek to the chin; there were paroxysms of pain in it in cold weather.

Diabetes Insipidus with Papular and Nodular Xanthomata.

By J. H. SEQUEIRA, M.D.

Dr. SEQUEIRA again showed a wasted, anæmic boy, aged 7, who had been before the Section at the December meeting.¹ The child then had an eruption of papules which suggested lichen planus, but were found on microscopical examination to be granulomata. The question of "tuberculides" was discussed at the meeting. The eruption had increased in extent, and many of the lesions had a yellowish tinge. The boy was the subject of diabetes insipidus. The condition raised so many points of interest that the exhibitor asked the Pathological Committee to report on the sections, and he proposed to publish the case *in extenso* in an early number of the *British Journal of Dermatology*.

The PRESIDENT welcomed Dr. Sequeira's suggestion that the case be referred to the Pathological Committee, and this was agreed to. He believed it was a xanthoma, and recalled the fact that xanthoma of diabetic type had been observed in some patients who had not had diabetes.

¹ See *Proceedings*, p. 65.

Case for Diagnosis.

By R. J. COLENZO, M.D.

R. T., AGED 58, married twice; father of twelve children, the youngest aged 6. For over twenty years signalman on District Railway. Born with a "pink wart" (? *nævus*) in front of the left ear. At the age of



FIG. 1.

Photograph of an indurated epithelioma of eight years' duration, following an injury to a *nævus*, or sebaceous cyst.

20 a barber caught it with a comb, when it bled profusely. From being sessile it then became pedunculated and frequently bled when knocked. It remained "about the size of a shilling" until ten years ago, when it was again injured by a blow against a box, bleeding profusely. From that time it had grown more rapidly to its present dimensions, involving the pinna and external meatus of the ear. Its surface was corrugated

and cracked, and bled on being touched or on laughing. A recent bleeding from the meatus relieved a partial deafness. The circumference of the growth had a peculiarly serrated appearance as if it had been stitched all round, but it had had no surgical or medical treatment worthy of mention. There was an enlarged gland below the angle of the ramus on that side. The patient was otherwise well and had not suffered from ill-health. He was a hard-working and temperate man.



FIG. 2.

The same, from a separate negative, showing extension of growth to the pinna and meatus.

DISCUSSION.

Dr. MACLEOD said it looked much like an epitheliomatous condition; a naevoid growth which had become locally malignant. One could not determine its exact nature without cutting sections of it. He considered that it would be a fair case for the application of massive doses of radium.

Dr. ADAMSON said he had recently seen two similar cases, one in which the lesion was unbroken, the other in which it had broken down. The latter

had been found by microscopical examination to be an epithelial growth. It got well after Dr. Haldin Davis had scraped it very thoroughly, and it had not recurred. These lesions he thought were either rodent ulcers or malignant epitheliomata. It would be difficult to treat the case shown surgically, because of its situation. He hoped a photograph of the case would be published, as it seemed to him to be a new affection—possibly a sebaceous gland epithelioma.

Dr. NIXON recommended eradicating the tumour more deeply than could be hoped for by scraping, and doing a plastic skin-graft on the area.

Dr. SIBLEY said he thought it might possibly be of sebaceous origin; he had seen long-standing sebaceous glands breaking down in this way after an injury. This lesion was more circular than would be expected in a nævus. He would apply a full dose of X-rays, and see the result, before attempting anything surgical.

Dr. DOUGLAS HEATH said he had had a case like this, which perforated through the ear, growing in an epitheliomatous or papillomatous way. He scraped it, and it got well, though the man lost the affected part of his ear. The gland in this case might be septic. In his own case an enlarged gland subsided after the scraping.

The PRESIDENT thought the growth was epitheliomatous, but suggested that a biopsy be made for microscopic examination, the treatment being based on its results.

Dr. GRAY thought that previous speakers had not paid sufficient attention to the glandular enlargement present in this case. The gland felt to him like a malignant one. He thought it was of the utmost importance in these cases to do a complete removal of glands, as recurrence usually took place there: the primary growth could be eradicated by excision, cauterization, or even X-rays or radium.

Dr. SEQUEIRA said he would curette and apply X-rays. Diathermy should also be thought of. He was now treating a case of extensive squamous-celled carcinoma, occurring on lupus, very much in the same site, by this means.

Case of Schamberg's Disease.

By A. WHITFIELD, M.D.

THE patient was a boy, aged 11, and was, as far as could be ascertained, organically sound. "Some long time ago" the present condition had made its appearance. It was certainly of many months' duration, and possibly some years. It had, at all events, not altered

at all during the ten weeks that Dr. Whitfield had had him under observation. The abnormality consisted in a curious reddish-brown discoloration of both arms from the wrist to about an inch above the elbow, and the legs from the malleoli to the junction of the lower and middle thirds of the thighs.

On close examination the brown colour was found to be made up of a fine network of brown macules and telangiectatic points which could not be emptied by pressure. Above the left knee there was an arrangement of telangiectases in the form of an oval, the vessels directing their branches away from the circumference and leaving an evenly brown-pigmented centre.

The diagnoses thought of were:—

(1) A fading purpura, but, on watching the case, this was easily excluded.

(2) Lichen planus. The presence of the well-marked telangiectasis was against this, and there were no papules anywhere.

(3) Angioma serpiginosum and Schamberg's disease, which the exhibitor regarded as varieties of the same thing, and this he considered to be the correct diagnosis.

Dermatological Section.

July 16, 1914.

Dr. J. J. PRINGLE, President of the Section, in the Chair.

THE PRESIDENT addressed a few informal remarks to the Section, referring to the successful work of the past Session, and thanked the various officers who had retired for their valuable services. He made special reference to the zeal and energy displayed by the Senior Secretary, Dr. J. M. H. MacLeod, whose work on behalf of the Section had been so eminently and uniformly successful. On his own behalf he thanked the members of the Section for their hearty co-operation in all the changes of procedure which had been introduced during the Session and for their unvarying consideration and courtesy shown to himself.

Case of Multiple Symmetrical Painful Fatty Tumours with Pigmentation.

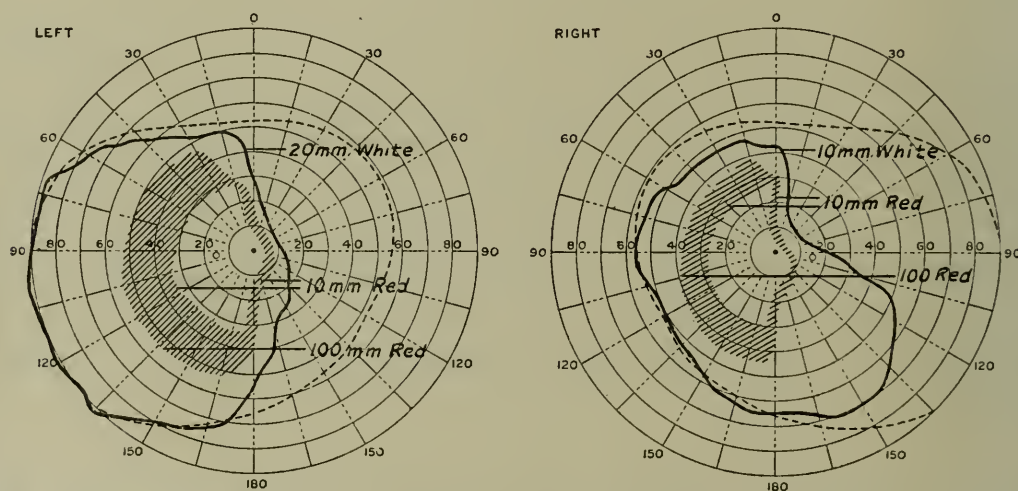
By E. G. GRAHAM LITTLE, M.D.

MRS. P., aged 47, was born in South Africa, and had lived all her life there.

Family history: Mother died of cancer; father died of a throat affection which was regarded as either cancer or tubercle; sister had a tumour excised from her back, nature unknown.

Personal history: The patient had been married eighteen years, and at the time of marriage had a single tumour on the buttock. She had had three children born alive, of which one lived three days, one seven months, and one died a few hours after birth. Confinements had always been difficult, but children had been born at full time and were always fat. After the last confinement ten years ago, four days after

delivery she appeared to have had an embolism following upon white leg, and became aphasic, remaining so for several months. Her memory was also entirely destroyed for a time, but now has largely recovered. She cannot, however, now spell any long words correctly, though she had been normal in this respect. During the last few years, and more especially latterly, she had developed very numerous tumours, chiefly on the arms—symmetrical, painful, and becoming blue on handling. She had put on fat generally, having increased 20 lb. in weight in two years. She had very severe and painful cramps which wakened her and rendered her sleep broken. She had painful symptoms of sensation of stoppage of the heart. Menstruation irregular and infrequent (? menopause). Distribution of tumours: Face, one; right arm, fourteen; left



Perimeter charts in the case of Mrs. P. (Supplied by the kindness of Mr. Bishop Harman.)

arm, thirteen; right hip, one; right thigh, one; left thigh, seven; left buttock, two. Melanodermic patches of recent development on both sides of the neck.

The husband stated that the patient had changed character and become irritable.

One of the tumours was excised in the last twenty-four hours and macroscopically appeared to be a lobulated fatty tumour, situated in the hypoderm (specimen exhibited).

Since the patient was shown, some further investigations have been conducted, and the following facts have been established: The temperature was usually subnormal, ranging round the level of 97° F. The sugar tolerance had been tested. The patient was given on an empty stomach 9 oz. of glucose, and the urine was examined before and

every hour after the administration of the dose. In the six samples taken after the dose and while the patient fasted there was no sugar passed. Her sugar tolerance may therefore be said to be raised.

A chart of the perimetric fields was taken by Mr. Bishop Harman, whom the exhibitor has to thank for permission to publish them.



Skiagram of skull of Mrs. P., the subject of multiple painful symmetrical fatty tumours. The arrow marks the sella turcica.

Mr. Harman accompanied these with the following note: "The fields do not correspond with the usual type of pituitary trouble, but they are characteristic of a hemiplegic lesion on the left side. It would appear that she had 'a clot of blood on the brain' ten years ago, and that she then had speech aphasia and paresis of the right side. Her husband is

positive of this, although the wife was inclined to think that the paresis was the other side. The fields, of which I send you a copy, do not absolutely exclude pituitary trouble, and I have seen similar ones in undoubted tumour cases. The fact that the colour fields agree with the white fields is, however, rather indicative of something that has been done for some time, and not something that is in the process of alteration at the moment. The disks show no definite change. There is nothing to lead one to suspect any optic nerve atrophy, a point which is in favour of the cortical origin of the lesion."

Dr. Harrison Orton examined the patient under X-rays and reports as follows: "The outlines of the sella turcica are well defined. It is perhaps rather deeper than the average, with a tendency to approximation of the clinoid processes, which is said, I believe, to be common in epileptics. I should not like to say, however, that these appearances are not merely individual anatomical peculiarities; there are evidently wide variations within normal limits. I could find nothing abnormal in the region of the larynx; there is some calcification in the thyroid cartilage, but I find this quite frequently in normal individuals."

A print of the skiagram of the skull is shown (*see* p. 269).

DISCUSSION.

Dr. PERNET said that pains were associated with the tumours, and these worried the patients a good deal.

The PRESIDENT agreed with the exhibitor in regarding the case as one of adiposis dolorosa; the involvement of the buttocks and shoulders, as well as the obviously considerable amount of pain, supported that diagnosis. The association of pigmentary disorders seemed to suggest some important ideas as to a common origin.

Dr. F. PARKES WEBER questioned whether the case should be called one of adiposis dolorosa; he considered it merely to be a case of multiple painful fatty tumours. There might, however, be some ætiological relationship with adiposis dolorosa, as both conditions might be associated with disturbance of internal glandular secretions.

Dr. WHITFIELD said he did not know whether all cases of adiposis dolorosa had calcified thyroids, though many had. It would be easy to ascertain that by means of X-rays. Some years ago he had a case at King's College Hospital, though less marked, and following treatment with thyroid gland many of them disappeared; he did not know whether it was a case of *post hoc* or *propter hoc*.

Case of Acute Lupus Erythematosus.

By E. G. GRAHAM LITTLE, M.D.

THE patient was resident in Pretoria, where he had lived since the war. He was engaged in a wholesale mercantile house, and had not mixed with the natives except that he had two native servants. At the end of February of this year he noted a small red patch at the tip of the nose. He was seen some time later by Dr. Mackenzie, who practises as a specialist in skin diseases in Johannesburg, and who diagnosed lupus erythematosus. Some five to seven sittings of X-rays were given and also some applications of freezing by ether snow, and the skin seemed to improve, especially on the hands, which had become affected later than the face. When he started on his voyage home the condition of the face was much less advanced than on his arrival; the hot voyage seems to have influenced it adversely, although he took pains to avoid bright sunlight. He had always been extremely constipated and has taken medicine daily for this, but had not succeeded in keeping the bowels open. He noted that the face was always worse when the constipation was not relieved. His urine at the first examination showed much indicanuria. After two Plombières douches and free purging this was no longer present. Scrapings were taken from the raised advancing edge of the disease behind the ears and stained for micro-organisms, but with negative result. The pigmentation came on only after the application of X-rays. Scrapings from the pigmented areas showed no fungus. The face had remained swollen for several months, but had never discharged.

He was regarded by Dr. Davis, a well-known surgeon in Johannesburg, as probably suffering from a chronic appendicitis, but the patient refused operation. He has been seen by the exhibitor's colleague, Mr. Warren Low, who reports that he can find no evidence of appendicitis. Since the patient arrived in England he had improved greatly on treatment by large doses of quinine, and measures to secure a daily evacuation of the bowel. Much of the initial redness has died away.

Description of the condition when first seen: The whole face was much swollen, intensely red over the greater part of it, but on each cheek near the malar eminences, on the forehead and on the neck the bright red surface was invaded by a dark brown discoloration which

seemed so superficial that it gave the appearance of being painted on, and was in fact so like the superficial pigmentation of pityriasis versicolor that scales were taken with the express object of excluding this possibility. But the patient's own explanation of the discoloration was that his skin was naturally very dark and the *red* colour is the new phenomenon which has displaced the natural skin. Behind the ears on both sides there was a sharply defined infiltrated raised livid red area with a very urticarial look, but obviously not urticarial, as it persisted unchanged for weeks. This area remained swollen after the swelling of the rest of the face had diminished materially. The breath was foetid and the tongue foul. On the dorsum of the hands on both sides there were patches of whitened atrophic skin with some blotchy redness interspersed in the white. These parts had been vigorously treated with carbon dioxide freezing and might be very well explained, as indeed the patient did explain them, as resulting from freezing surfaces previously red and constituting the most characteristic patches of lupus erythematosus.

DISCUSSION.

The PRESIDENT had seen the case in consultation with Dr. Graham Little three weeks previously and had concurred in his diagnosis, although the condition of the face was extremely difficult to pronounce upon owing to the various methods of treatment which had been adopted. He had had little or no hesitation, however, in diagnosing the disease on the back of the hands as erythematous lupus, and this opinion was borne out by the very curious, definite, festooned spreading outline of the raised erythematous patch on the neck. He was responsible for the treatment by Plombières douches and large doses of quinine, and confirmed the exhibitor's observation of the great improvement which had occurred.

Dr. PERNET asked whether Dr. Little did not think there was an underlying melano-leucodermia; he did not consider the pigmentation and the white areas on the eyebrows were due to X-rays.

Dr. ADAMSON said that he had not the opportunity of seeing the case in the earlier erythematous stage described by Dr. Little and the President, and he would, from the present appearances, have diagnosed the condition as leucodermia with sclerodermia—two affections which were sometimes associated. He regarded the white areas on the face as leucodermia and the dark patches as normal skin bronzed by exposure to the sun. The white areas on the hands were thickened, as could be felt on pinching them up between the fingers, and these he thought were patches of sclerodermia. He suggested that the acute redness of the non-leucodermic patches, which was seen in February, was due to exposure to the sun of areas unprotected by the normal pigment.

Case of Schamberg's Disease.¹

By E. G. GRAHAM LITTLE, M.D.

THE patient is aged 56. He has never lived out of Great Britain. He enjoys good general health. He has had no venereal disease; no varicose veins. His family history is unimportant; the only skin detail is that his father is said to suffer from psoriasis. The condition began twenty-five to thirty years ago with the patch on the left leg. On the right leg, where the patch is actually now larger than on the left, the disease only showed itself about eight or ten years ago. Within the last few months the small isolated punctate lesions in the neighbourhood of the larger patches began to appear. There is no lesion elsewhere than on the legs. The affected areas are moderately itchy, but show no other abnormal sensations.

Present state: Below the knee on each leg on the anterior surface there are large patches, 3 by 5 in. in area, of cayenne-pepper-like punctate deposits of pigment, so closely aggregated as to produce plaques of pigmentation, forming curiously angular shapes with sharply linear and sometimes serpiginous outlines. The general effect is that of a buff-coloured tattooing of the skin. There is in addition to the pigmentation a slight degree of scaling.

The case closely resembles another case of this rare disease shown by the exhibitor at the Dermatological Society of London in June, 1902, a water-colour drawing of which, together with sections of the skin, were exhibited.

DISCUSSION.

Dr. DOUGLAS HEATH said he had recently had under his care one marked instance of this disease in an old lady, aged 73. She had no varicose veins, and rather prided herself on the whiteness of her skin. There was a triangular-shaped area of involvement beneath each knee, such as one would see in a psoriasis patch. Several of the circinate lesions seemed to have coalesced to form a large patch. There were circular lesions with pigmented areas round the margin. There were also small isolated spots lying beyond the main areas. The disease extended to the umbilical level and was very profuse, and included both buttocks. It had been noticed only five months, and there had been no itching or any eczema or other dermatosis. The disease was probably more common than it was usually thought to be; it might often be mistaken for varicose pigmentation.

¹ Schamberg, "A Progressive Pigmentary Disease of the Skin," *Brit. Journ. Derm.*, 1901, xiii, p. 1.

The PRESIDENT thought the condition was essentially one of capillary dilatation with a very small amount of hæmorrhage, and agreed with the view recently enunciated by Dr. Whitfield that it was closely associated, if not identical, with angioma serpiginosum. He had certainly seen a considerable number of cases, although seldom consulted expressly for it. One of the severest cases he had observed was in a lady, aged about 50, with slight albuminuria and very high arterial tension.

Case of Pityriasis Rosea with some Unusual Characters.

By E. G. GRAHAM LITTLE, M.D.

THE patient was a girl, aged 12, who presented a completely typical eruption of pityriasis rosea on the trunk, which had shown itself about two weeks ago. There were three features which rendered the case remarkable. The pioneer patch had appeared on the face, on the left cheek, three clear days before any other lesions; it had been mistaken for tinea circinata. The face was much occupied at the present time by the eruption, and the largest—i.e., the initial patch—could still be identified. The presence of the pioneer patch on the face was most unusual. Secondly, there were numerous typical patches on the dorsum of the hands and feet, although the eruption was scanty as a whole and did not occur on the intervening area between these parts and the main incidence of the rash, so that it was not a case of these unusual positions being affected, because the eruption was generally copious. In his recent review of the disease the exhibitor had found very few instances recorded of the hands and feet being involved.¹ Thirdly, there were a number of vesicles, the size of a large pea, on the upper and inner border of the instep and on the soles of both feet, interspersed with typical rose-pink slightly scaly patches of pityriasis rosea. This admixture served to differentiate the condition from an ordinary dysidrosis which it otherwise strongly resembled, except that the distribution was also unlike that of dysidrosis.

The exhibitor had found only one instance recorded of vesication in pityriasis rosea, a case shown by Dr. Colcott Fox at the Dermatological Society of London in 1906.² It had been suggested that vesication was not infrequent in pityriasis rosea of childhood. The exhibitor could only say that he had been in continuous charge of one of the largest

¹ *Proceedings*, p. 132.

² *Brit. Journ. Derm.*, 1906, xviii, p. 281.

children's out-patient skin departments in London, that of the Shadwell Hospital, for the past eighteen years, and he had never seen it. Dr. Colcott Fox, who had also had a very long and special experience of children's skin diseases, had never seen it, as he expressly states in his comment on his case recorded above. Dr. MacLeod and Dr. Dore, who have also large special children's departments, assured the exhibitor that they had not met with it.

DISCUSSION.

Dr. ADAMSON said he had seen several cases of pityriasis rosea with vesication about the hands. All these cases had been in children, in whom it frequently happened that the lesions of pityriasis rosea spread beyond the usual "vest-area" limits on to the limbs and face. He was convinced that the vesicles on the hands were part of the pityriasis rosea eruption, and not a concurrent dysidrosis. Microscopic vesicles were seen in sections of pityriasis rosea of the trunk, and those on the hands were probably an exaggeration of that condition.

The PRESIDENT said that he remembered on two occasions having observed herald patches on the face. In one case, which he thought was unique, he had seen the primary patch occur on the glans penis, and the condition puzzled him considerably. It was not until three or four days afterwards that the diagnosis became clear by the appearance of characteristic lesions on the trunk and limbs. Some cases with marked vesication had been reported in America, and he had seen a good number himself which showed distinct fine vesication clinically, though not, as far as he could remember, on the hands or feet. But he saw comparatively few young children, while Dr. Adamson saw a great many. The first recognition of microscopical vesication, was, he thought, due to Sabouraud.

Case of Sclerema Neonatorum in an Infant.

By E. G. GRAHAM LITTLE, M.D.

THIS was an infant, now aged 9 weeks, in whom the disease had commenced on the day after birth with "lumps" on the back. The child had been born cyanosed, and was subjected to artificial respiration.

Family history: The parents were both healthy and there was no evidence of syphilis in either. The mother had had a miscarriage with her first pregnancy, but not since. Two children had died in childhood from causes which were not ascertainable, but the other children were healthy.

Present state: The whole surface of the body was of a livid bluish-red colour. The indurated swellings characteristic of the disease occupied the whole of the back, the shoulders, the neck and upper arms. Isolated lumps, about $1\frac{1}{2}$ in. in diameter, in distinction to the diffuse indurated sheet-like infiltrations in the sites named above, were present in the cheeks and on the buttocks. Indurated diffuse swellings were also found on the anterior surfaces of the forearms as far as the wrists, which were free, and also around the mammæ and on the anterior and upper chest wall. The child had been admitted to the East London Hospital for Children when aged 5 weeks, and three days after admission the induration had extended down the back and on the thighs and calf. The weight was taken on various dates as detailed below: On June 24, the day after admission, it was 9 lb. 5 oz.; on June 29, 9 lb. 13 oz.; on July 5, 10 lb. 4 oz.; on July 9, 10 lb. 5 oz.; on July 16, 9 lb. 12 oz.

The induration became gradually softer by July 3. The child throughout apparently was very little disturbed by the condition, took food well, and was good-tempered and happy. The motions were quite normal. The temperature, the day after admission, rose to 101° F., but fell within a few hours to normal, and was raised to 101° F. again only on one occasion, on July 9, from causes undetermined.

The only treatment adopted was to place the child in cotton lint spread with antiphlogistin, but the heat of this application seemed to irritate, and it was omitted after ten days' trial, after which there was no treatment except keeping the child warmly covered. The indurated masses were everywhere softening, and the prospects of recovery were now excellent.

Case for Diagnosis; (?) Xanthoma Multiplex.

By W. KNOWSLEY SIBLEY, M.D.

THE patient, a boy, aged 16, was sent to me by Dr. F. Copeland, and was stated to have had an eruption on the body since he was 8 years old, which had become much worse the last three years. Both parents, two brothers and four sisters, are living and well.

Though a fairly well developed youth, he was anæmic and looked ill. The temperature at night varied from 100° to 101° F., and was usually subnormal in the morning. His voice was hoarse, and he

had a slight cough with expectoration. No physical signs could be detected in the chest, nor were tubercle bacilli present in the sputum. A von Pirquet test was found to be negative, so also was the Wassermann reaction. Considerable œdema of the legs had been present for



FIG. 1.

Showing general distribution of the lesions, and their absence from the centre of the chest and cheeks.

two or three weeks. The urine was very thick, high-coloured, and contained albumin, a few pus cells, red and white blood cells and staphylococci, also coarse granular casts. No tubercle bacilli were to be detected, nor was sugar or bile present. There was a general enlargement of the lymphatic glands, and a large one in the left groin broke down

some two years ago, and discharged for about a fortnight. Differential leucocyte count: Polymorphonuclear cells, 65 per cent.; lymphocytes, 30 per cent.; eosinophiles, 2 per cent.



FIG. 2.

Showing general distribution, with abundance of lesions on the back of the neck and absence from the interscapular regions; œdema and bullous eruptions on the legs and palms.

An extensive papular and nodular eruption was present over the greater part of the body and limbs. Most of the lesions were raised, oval or round, and very firm to the touch, being of a distinct tumour

formation. The colour of the papules varied from rose to red, many had a distinct semitranslucent, yellowish-red, waxy appearance.

The rash was present almost everywhere, except over the sternum in front, and the interscapular regions behind, and the scalp, and was only slightly present on the legs. It was most abundant on the back of the neck, where the skin was generally thickened and infiltrated, and lay



FIG. 3.

Abundant lesions on back of neck, some with tumour-like formation; absent from interscapular region.

in folds. The arms and forearms were covered with the papules and generally infiltrated. The penis and scrotum were also extensively involved. The cheeks themselves were free from the eruption, but papules, rather paler in colour than those over the body and limbs, were present on the forehead, eyelids, ears, bridge and sides of the nose,

extending more or less in a line down the outer angles of the mouth, on to the chin in the form of a triangle, with its base on the chin, the upper lip being unaffected. The palms and soles were considerably thickened, and the hair-follicles over the dorsum of the fingers were prominent. No eruption was present in the axillæ or popliteal spaces. The teeth were good and the nails were unaffected, so also were the mucous membranes.

The whole condition had recently been complicated by a rather severe attack of (?) impetigo, presumably produced by scratching, the lesions being often very irritable.

Report of the section taken from the group of lesions situated on the back of the neck: The layers of the epidermis were practically normal, the chief changes being noticed in the dermis, which appeared to be a connective tissue new growth, of an inflammatory nature. Here and there were to be seen some deposit of yellowish pigment granules, and some large cells which had a defined membrane, and showed a deposit of fat granules with several nuclei lying between the cells. The blood-vessels were dilated.

DISCUSSION.

The PRESIDENT suggested that the case, along with that shown by Dr. Sequeira at the last meeting, should be submitted to the Pathological Committee. It recalled to his mind a somewhat similar one shown by Dr. MacCormac at a recent meeting¹ of the Section, and then generally considered to be a hitherto unrecognized clinical type of "prurigo senilis."

Dr. WHITFIELD said it looked like a chronic urticarial condition; it had, more or less, the pathological anatomy of prurigo; one member when looking at it thought it was Hebra's prurigo. It had appeared at 8 years of age, which was not remarkably late for prurigo to begin. Both to the eye and the finger the lesions seemed to be mainly œdematous; and in the section under the microscope the main feature seemed to be œdema, the collections of cells there he regarded as chiefly polymorphs, not fibroblastic cells; but further staining would be required in order to be certain; the section showed enormous vascular dilatation. It was not easy to say whether they were venous or lymphatic capillaries, they were simply endothelium-lined spaces. He regarded the lesion as a chronic inflammatory urticaria. There was no relationship to xanthoma as suggested by the exhibitor. He did not think the cells in the section were plasma cells.

Dr. ADAMSON said that he was unable to make a diagnosis of the case, but the absence of intense itching seemed to negative the diagnosis of prurigo

¹ *Proceedings*, p. 69.

or of lymphadenoma. The patient sat quite calmly without attempting to scratch, and there were no scratch marks, and this was quite unlike the behaviour or appearance of a patient with an intensely itchy eruption.

Dr. STOWERS said that he was so much impressed with the general outline of this case when he first saw it that he at once associated it with the cases of genuine prurigo which were collected by the late Mr. Morratt Baker and demonstrated at the old Dermatological Society of London and elsewhere. When the lad denied itching—which was always so prominent a symptom—probably he misunderstood the question put to him, for now it was admitted. Dr. Stowers agreed with Dr. Whitfield's remarks and considered the case specially suitable for investigation and report by the Pathological Committee.

Dr. MACLEOD had never seen a similar case and had come to no definite conclusion about it. It did not seem to him that the condition was a prurigo. Clinically, certain of the lesions, especially those about the extensor aspects of the arm, presented a semi-translucent appearance which somewhat suggested the "frog-spawn" skin met with in the lymphoderma which precedes elephantiasis nostras; microscopically there seemed to be a new formation of fibrous tissue around dilated spaces which were probably lymphatics.

Case of Lupus Vulgaris.

By W. KNOWSLEY SIBLEY, M.D.

THE patient was a single woman, aged 41, with severe old-standing lupus vulgaris affecting nearly the whole of the mucous membrane of the mouth, pharynx and nostrils, with a patch on the left cheek, and general infiltration of both upper and lower lips with granulomatous deposit. Her father died from heart disease, and her mother at the age of 81 from senile decay. She was one of thirteen children, nine of whom died young; all the survivors were healthy and well. She was stated to have had scarlet fever when she was aged 7, with a severe sore throat, which has remained ulcerated ever since. From the throat the disease spread to the interior of the nostrils, and eventually appeared at the tip of the nose, the whole of which had ulcerated away and the anterior nares had been completely occluded for the last twenty-two years. Some three years ago the disease appeared on the outside of the left cheek; this had been healed for about a year, after applications of acetone carbon dioxide snow.

The recent treatment had been by nascent iodine, both internally and locally to the inside of the mouth. The patient took 20 gr. of iodide of potassium in a tumblerful of water every morning directly

after breakfast, followed four, six, and eight hours afterwards by an ounce of chlorine water, in a tumblerful of home-made lemonade. Locally, a powder consisting of equal parts of iodide of potassium and chalk was blown by means of an insufflator on to the areas of tubercular ulceration in the mouth, and the mouth was immediately rinsed out with chlorine water, this being held in the mouth as long as possible. Under this treatment there had been a considerable improvement in the amount of infiltration, especially of the upper lip, which before it was begun some three weeks ago was almost rigid, and all movements were very painful.

The chlorine water was prepared after Dr. Curle's method, as follows : 1 dr. of powdered chlorate of potash was placed in a 24-oz. bottle, and 2 dr. of strong hydrochloric acid were added, and the mixture allowed to stand for twenty to thirty minutes ; water to the amount of 4 oz. at a time was gradually added, the bottle being well shaken between each addition of water up to the 24 oz.

Dr. WHITFIELD asked that the case might be brought for further inspection in three months' time. The President supported the request, and Dr. Sibley acquiesced.

Case of Superficial Ulcerations due to Chalk-stones.

By J. M. H. MACLEOD, M.D.

THE patient was a nervous woman, aged 38. In 1896 she was an in-patient at the Charing Cross Hospital on account of severe anæmia and a feeble peripheral circulation ; since then her general health had improved. The affection from which she at present suffered began six years ago. It first appeared as red patches which were tender to the touch and felt hot ; these were situated on the knees and fronts of the legs. After several months the patches became more painful, chalk-stones appeared in the centre of them, suppuration supervened, and the chalk-stones broke through the surface, became loose and finally separated, after which the patches healed, being followed by slight scarring. At the time of exhibition a number of these patches were present. On the extensor aspects of the arms below the elbows were symmetrical patches about 3 in. in length, which were irregular in outline and presented chalk-stones and superficial ulceration in the centre. Large patches were also present above the ankles, while isolated inflamed lesions, with chalk-stones in the centre, were present

in front of the knees. The fingers were also affected. The first finger of the left hand was inflamed and smooth like sclerodermia and a chalky deposit was present near the tip. The second finger showed a chalky deposit beneath the nail. The feet were not markedly involved, but there was some scarring on the right big toe and a history of several attacks of pain and swelling in it, suggesting gout. The chalk-stones were of a whitish-grey colour and varied in size up to a split pea or larger. The smaller stones were oval or roundish in shape while the larger ones were irregular and conglomerate. An examination of the circulatory system showed that the peripheral arteries were definitely hard.

The exhibitor considered the condition to be a general affection in contradistinction to the local calcareous deposits met with occasionally in lupus vulgaris and other conditions.

DISCUSSION.

Dr. F. PARKES WEBER said that a good many of the morbid concretions in this patient were localized in other parts than the fingers. He asked whether a microscopical section of a lesion after decalcification had been examined. In this kind of case the deposit of calcium carbonate and calcium phosphate occurred in a meshwork of fibrous tissue, a sort of sponge. At a later stage the fibrous meshwork might become necrotic, and in that way a real chalk-stone might conceivably arise. Much of the literature of the subject was given in a paper which he wrote with Dr. R. E. Scholefield in 1911.¹ Dr. MacLeod's case showed that the sclerodactylia which was present in some cases was not an essential feature at the commencement of the disease. In the case of a child, which he described and demonstrated at the Seventeenth International Congress of Medicine, the giving of iodide of iron, mixed with a little iodide of potassium, did some good, continued over a long time.² But the pathology of that case might possibly differ from that of the present class of case, to which latter he believed the name "chalk-gout" or "Kalk-Gicht" had been given by some writers on the subject.³

Dr. WHITFIELD said Dr. Briscoe had a case somewhat similar, but not on all fours, because there was a definite history of trauma of one thumb, and the calcified nodules were progressive along the hand. Dr. Briscoe gave phosphoric acid internally for a long time, but could not be sure whether it diminished the

¹ *Brit. Journ. Derm.*, 1911, xxiii, p. 276.

² F. P. Weber, *Proc. Seventeenth Internat. Med. Congr.*, Dermatology (pt. ii), 1914, p. 179.

³ See H. Wildbolz, "Ablagerung von Phosphaten und Karbonaten in Haut-und Unterhautgewebe unter den klinischen Erscheinungen echter Gicht," *Correspondenzblatt f. Schweiz. Aerzte*, Basel, 1902, xxxii, p. 232.

nodules which were already there; still, no new nodules came after that treatment. It was worth trying, because the metabolism of lime seemed to be intimately connected with that of phosphoric acid.

Dr. GRAHAM LITTLE suggested that the acidity should be tested by Joulie's methods before Joulie treatment was adopted. If the urine proved to be consistently hypo-acid by those tests a strong case was made out for administration of phosphoric acid, but this should be given in doses which might be regarded as adequate, that is in much larger quantities than authorized by the British Pharmacopœia. He had had many opportunities of convincing himself of the value of these methods of treatment and he strongly supported Dr. Whitfield's suggestion.

Dr. ADAMSON asked whether this case belonged to the group of calcareous deposits in the skin which had been described by French and German writers as subcutaneous calcareous granuloma, in which the earlier lesions consisted of nodular collections of embryonic cells, with giant cells, with the central parts occupied by calcareous granules, and older lesions of fibrous-walled cavities filled with chalky matter. A list of published articles on this subject would be found in the recent edition of Clifford Allbutt and Rolleston's "System of Medicine."

Dr. MACLEOD said he had a case of tuberculosis which was becoming calcareous, and there were numerous instances.

Case of Mycosis Fungoides.

By DUDLEY CORBETT, M.D.

THE patient, a married woman, had an attack of puerperal fever in 1898, following the birth of her last child. She was in hospital three months. Shortly after her discharge a bullous eruption appeared on both hands. This condition cleared up in the autumn of the year and recurred during each of the two succeeding summers, lasting about four months on each occasion.

In 1900 a small rounded swelling appeared on the face immediately in front of the left ear, accompanied by a good deal of irritation. She states also that there was a tumour in the throat, which was removed surgically at another hospital. Fresh tumours gradually appeared on the face, and in 1904 she was admitted under Dr. Stainer to St. Thomas's Hospital. There were at that time a few small swellings on the face and a group of red grape-like tumours arising from the labia majora. The diagnosis of mycosis fungoides was made and the vulvar

tumours were removed surgically, while those on the face were treated with X-rays. In 1905 she was stated to be free from growths.

In March, 1908, there was a recurrence of the tumours on the face. She was again treated with X-rays, and in July was reported clear. It was found that nine and a half pastille doses were given over each area during four and a half months, a fact which can well account for the skin atrophy.

In the autumn of 1913 one or two small swellings appeared on the legs accompanied by a certain amount of irritation. Early in this year there was a considerable increase in the irritation and dark red eczematous patches appeared on both legs. There were one or two new tumours on the face and a small lesion on the right lower lid close to the inner canthus. She was being treated at Moorfields Hospital for this, applications of CO₂ being employed which have reduced the size of the tumour. On returning to St. Thomas's Hospital she was put on X-ray treatment, one-half pastille dose unscreened being administered once a fortnight over each area. The result has so far been excellent, the irritation subsiding and the tumours disappearing rapidly.

Lately she has noticed a difficulty in swallowing, and on examination one finds a small rounded tumour involving the right free edge of the soft palate. This will shortly be removed surgically, and it is hoped that sections will be shown at the next meeting.

An examination of the blood shows a normal count with the exception of 6 per cent. of eosinophiles. The spleen was not palpable, nor was there any other physical abnormality detected.

It is apparently very rare for the mucous membranes to be involved in mycosis fungoides.

He was indebted to Dr. Stainer for permission to publish this case.

The PRESIDENT said the most unusual feature in the case was the tumour on the soft palate, as to the nature of which he interrogated the exhibitor.

Case of Acute Erythematous Miliary Lichen Planus.

By S. E. DORE, M.D.

THE patient was a woman, aged 24. The eruption which had begun on her arms three months previously, and spread over the trunk and legs, consisted of minute, closely aggregated, shiny, reddish-brown papules which in parts coalesced to form circinate patches. On account of the

small type, close aggregation and erythematous character of the lesions the similarity to pityriasis rubra pilaris was somewhat striking, but the eruption was absent from the dorsal surfaces of the phalanges and the presence of a characteristic patch of lichen planus on the buccal mucous membrane of the right side of the mouth confirmed the diagnosis.

Case of Patchy Erythematous Eruption for Diagnosis.

By S. E. DORE, M.D.

A MAN, aged 24, sent to Westminster Hospital by Dr. A. Cope, who had suffered from a patchy erythematous eruption of four months' duration on the neck, chest, back, and upper arms. The patches were irregular in shape, some being angular, others circinate in outline, while those on the back were linear and showed a tendency to follow the lines of cleavage; they were brownish-red in colour and were neither scaly nor definitely infiltrated, nor accompanied by severe itching, although the patient stated that they caused considerable irritation when he was hot. His blood count was normal and the Wassermann reaction negative. The diagnosis favoured by the exhibitor was parapsoriasis en plaques.

DISCUSSION.

Dr. PERNET suspected mycosis fungoides in an early stage: the peculiar shape of the lesions were in favour of that diagnosis. The white areas formed the convex part. He did not agree with Dr. Dore as to there being no infiltration. He would use X-rays, because if the patches cleared up under them that would be a strong diagnostic point in favour of mycosis fungoides. Dr. Pernet asked what some of the speakers meant by parapsoriasis.

Dr. GRAY said that, except in one point, this case bore an extraordinary resemblance to parapsoriasis en plaques, and that point was the deep colour of the lesions. A case he showed not long ago was generally agreed to have been of that nature; in it the lesions were linear as if they had been produced artificially. In the early stages, many of the lesions did not show any scaling at all. One of the striking points about the ordinary case of parapsoriasis was that the lesions were of a pale pinkish-yellow colour and little visible, whereas these lesions were sharply marked. Possibly the arsenic he had been taking caused a deepening of the colour of the lesions. He asked whether it was now clearing up under local treatment.

Dr. STOWERS did not regard this as a case of mycosis fungoides, some features common to that disease being absent, but he admitted the difficulty

of diagnosis at the present stage. On the whole, he inclined to the view that it was an instance of parapsoriasis en plaques. He hoped the case would be exhibited again in three months' time when the effects of the suggested treatment could be noted.

The PRESIDENT remarked that the patient presented only one lesion which exhibited anything like the pad-like appearance which he regarded as characteristic of early mycosis fungoides—namely, a circinate patch on one shoulder. Many of the primary plaques had sharp linear and angular outlines which he had never seen in a so-called pre-mycotic eruption. He would be largely guided, as Dr. Pernet suggested, by the result of the application of X-rays as a therapeutic test, as in his experience X-rays did not materially affect parapsoriasis. And he considered that the microscope would be of great help, as the histological appearances of parapsoriasis were quite dissimilar from those of early mycosis.

Dr. DORE replied that the condition was now stationary. There seemed, however, to be slightly more pigmentation than a month ago, although he had not had arsenic during that period. Previously he had taken only 4 minims of liquor arsenicalis three times daily for a fortnight. The case closely resembled one he had shown two meetings ago, which the President thought was mycosis fungoides on account of the pad-like character of the lesions. He (the exhibitor) had not been able to detect any infiltration in the present case.

Case with Subcutaneous Nodosities for Diagnosis.

By S. E. DORE, M.D.

THE patient was a man, aged 43, who presented several subcutaneous nodosities about the size of a walnut, of twelve months' duration, on both sides of the back above the sacrum. The tumours had been preceded by enlargement and suppuration of the right inguinal glands, probably of a tuberculous nature, three years previously, and now represented by an extensive irregular scar in that neighbourhood. The Wassermann reaction had given a negative result. Although the exact nature of the condition was uncertain, the livid appearance and transitory character of the lesions suggested that it was a tuberculide probably corresponding to the sarcoïdes hypodermiques of Darier-Roussy.

DISCUSSION.

Dr. GRAY asked whether a tuberculin reaction had been done on the patient. He was much interested in this sarcoid group, because it was not certain that all were of tuberculous origin. A certain high percentage gave a negative reaction to tuberculin.

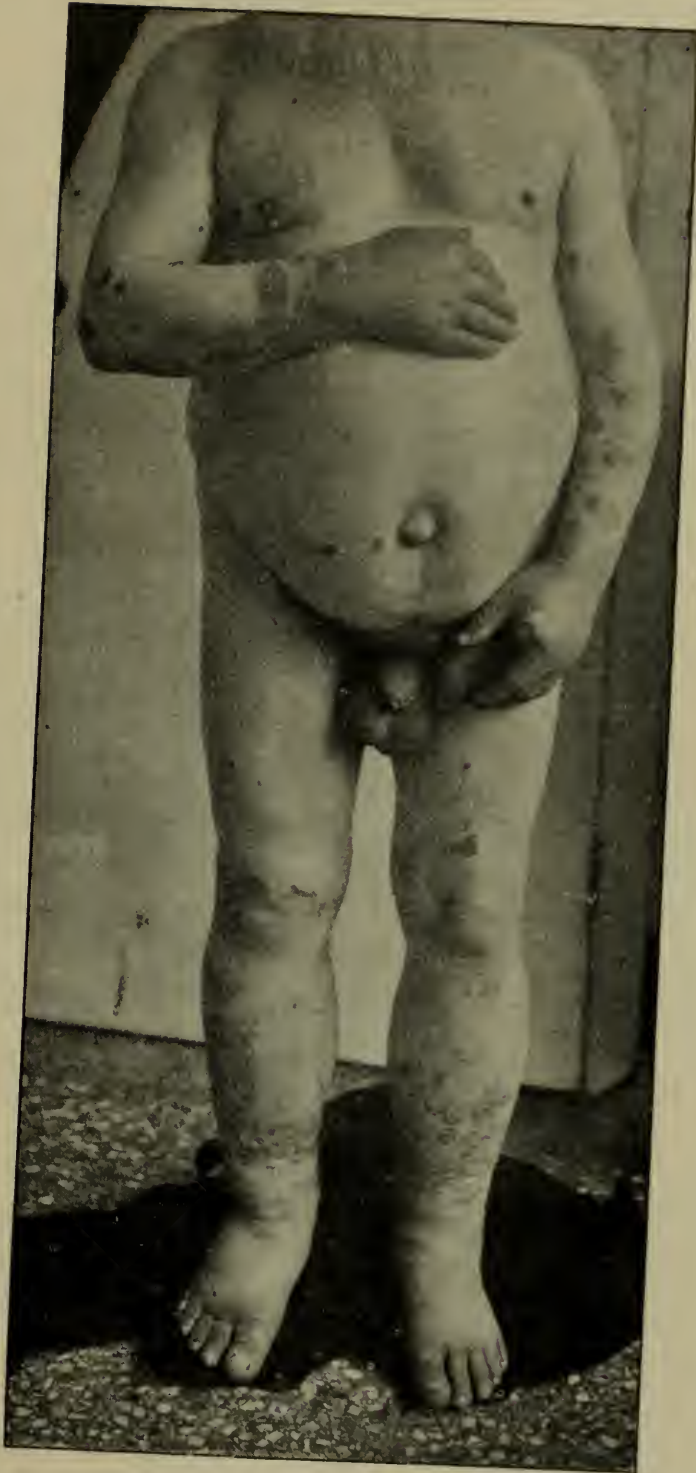
Dr. DYSON said that inoculation experiments were positive in a fair percentage of these cases.

Dr. DORE replied that one could not attach much importance to the tuberculin reaction in this case, because the patient had had a tuberculous gland in the groin, and it did not follow that the lesions on the buttocks were of the same nature.

Idiopathic Multiple Pigment Sarcoma (so-called) of Kaposi.

By F. PARKES WEBER, M.D.

THE patient, G. Z., aged 76, a Jew from Russian Poland, was a strongly built, corpulent man, of rather plethoric appearance. Over his extremities, and to a lesser extent over his face and trunk, were raised spots and plaques of various shapes and sizes, varying in colour from red or purple to brownish-purple. The brown colour (due to deposition of hæmosiderin ?) was well seen when the blood was squeezed out of the lesions by pressure, with a glass lens. The distribution of these spots and plaques was mainly peripheral, that is to say, it was of the "acro" type, the lesions being actually confluent at the extremities of the limbs, so that both hands and both feet appeared uniformly turgid and of a purple colour. The legs, up to the knees, and the forearms were much more affected than the thighs and upper arms. There was (as usually in these cases) chronic œdema of the legs up to the knees. He had several spots over the buttocks and a few over the abdomen (*see figure*). Scattered over the face were red papules of the same nature, and on the glans penis at the urethral orifice was a swollen hypertrophic papule, which is now pale, but was said to have been formerly red, like the other lesions. On the whole, the lesions were more raised and hypertrophic looking, and more dusky (from congestion) on the legs than on the arms. Some of the larger plaques were paler and less raised in parts (especially in the central parts) as if they were fading away there, whereas in other parts



To show plaques on the extremities and the swollen condition of the legs.

—for instance, sometimes on one side—they appeared to be still active, as if in fact the lesions in question were spreading in one direction and undergoing involution in another. Pruritus did not seem to be a troublesome feature.

There were as yet none of the little pedunculated, pendulous, berry-like outgrowths seen in some cases of the disease, as in that described by F. P. Weber and P. Daser in the *British Journal of Dermatology* for April, 1905 (xvii, p. 135). In the present case the disease seemed to have commenced gradually two years ago. The patient had been a strong man; he did not appear to have suffered from gout (*vide* remarks of Sir Jonathan Hutchinson in the *Archives of Surgery*, v, p. 237, and vi, p. 132, and elsewhere). There seemed to be no disease of the thoracic and abdominal viscera, excepting slight bronchitis; the urine was free from albumin and sugar.

It had been suggested somewhere, he thought, that certain cases diagnosed as examples of “idiopathic multiple pigment sarcoma” were really instances of a peculiar clinical variety of lichen planus, the disease having been modified by its occurrence in gouty and congested subjects. Dr. Weber was at first doubtful whether the broad plaques on the forearms accorded with typical cases of so-called “idiopathic multiple pigment sarcoma,” but the President had kindly informed him that such plaques did occur in undoubted cases of that disease. Microscopical examination of one of the lesions in the present case showed œdema and a chronic, apparently inflammatory, infiltration of the corium, with many newly-formed lymph-spaces and blood-spaces and endothelial cells.

The PRESIDENT said there was no doubt that the case was a quite typical one of the disease mentioned by Dr. Weber. It was curious for this man, a Pole, to have developed the condition after twenty-two years' residence in this country. He did not think the patient knew the meaning of the word gout, and he certainly had never suffered from it. Dermatologists were unanimous that the disease was not sarcoma at all. He believed that favourable results from X-rays had been reported, but it must be borne in mind some of the cases recovered spontaneously. In his first case, which was under Sir Stephen Mackenzie and himself, the hands recovered absolutely, but with atrophy of the muscles resulting in claw-hands, like those of leprosy.

PROCEEDINGS
OF THE
ROYAL SOCIETY OF MEDICINE

VOLUME THE SEVENTH

COMPRISING THE REPORT OF THE PROCEEDINGS FOR THE
SESSION 1913-14

Section 7.
ELECTRO-THERAPEUTICAL SECTION



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1914

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Electro-Therapeutical Section.

October 17, 1913.

Mr. C. THURSTAN HOLLAND, President of the Section, in the Chair.

Case of Keloid treated by X-rays.

By E. P. CUMBERBATCH, M.B.

THE patient, a girl, aged 8, received a burn on her face and hands in December, 1911. Keloid developed on the face. It took the form of a linear ridge, raised $\frac{1}{8}$ or $\frac{1}{12}$ in. from the level of the skin, and in thickness measuring about the same. It was traced in a curious pattern over a large part of the left cheek and the left side of the nose. Keloid was also present on the right cheek and on the chin.

X-ray treatment was commenced on May 31, 1912. The parts to be treated were divided into four areas and each area was treated separately. An area received during a session not more than a half pastille dose (Sabouraud, tint B) and was allowed at least a fortnight's rest before repeating the dose. The rays were not filtered. The skin in between the keloid ridges was protected by a plastic preparation containing lead oxide, which could be easily moulded to the outline required.

After six weeks the keloid ridge on one of the areas was found to be softer and flatter, and after nine weeks it was level with the skin and the only visible indication of its presence was the faintly hyperæmic condition of the skin at the original site of the ridge. The keloid of the other areas disappeared more slowly. A ridge is still present, though softer and less conspicuous, on the side of the nose. On the other parts there is also the remaining hyperæmia, and here and there slight thickening of the subcutaneous tissue can be felt. During the present year the treatment has been applied on a few occasions only, as the patient has not been able to attend regularly.

**Case of Obstruction in the Transverse Colon caused by
a Kink.**

By C. FRED. BAILEY, M.D.

THE patient was a male, aged 40, thin and worn. He had had attacks of pain off and on, at irregular intervals and for indefinite periods, for ten years. The pain was violent, griping, and situated above and to the left of the umbilicus; it lasted for some hours or for several days at a time, and there were intervals of days or weeks during which he was free from pain; it was somewhat relieved by taking food. He was rather constipated, but all purgatives much increased the pain. He had always been in good circumstances and previous to the onset, ten years ago, had been in excellent health. Eight years ago he had undergone an operation on the supposition that his symptoms were due to omental hernia, but no relief had ensued. "Various views had been expressed by consultants as to the cause of his symptoms." Diagnoses of appendicular colic, colitis, duodenal ulcer, malignant disease of the colon, and "splenic trouble" had been made.

On examination no tenderness was found over the area where pain occurs, but there was general abdominal uneasiness on palpation. The area of the transverse colon was tympanitic. Two ounces of bismuth oxychloride were given in cornflour and milk at 12 noon. Patient was examined in the upright position. Bismuth dropped at once into the pyloric end of the stomach (which was altogether below the umbilicus); peristalsis quite feeble. As the diaphragm was at its normal level, there did not appear to be general enteroptosis, the appearances pointed rather to a dilated atonic stomach. The gas-filled transverse colon was seen descending in a curve below the stomach. It was shown well on the right of the umbilicus and at the splenic flexure; to the left of the umbilicus it was not so evident. At 5 p.m. on the same day (five hours after taking bismuth) the stomach still contained bismuth in a flat-surfaced, shallow pool, the pyloric end had sunk lower than at the previous examination, much bismuth was in the small intestine but none in the cæcum. Seen next day at 3 p.m. (twenty-seven hours after bismuth), the bismuth had not passed beyond the middle of the transverse colon. All the bismuth meal was in the cæcum, ascending colon, hepatic flexure, and right half of the transverse colon. Next day, at 3 p.m. (fifty-

one hour after bismuth), it had *nearly reached* the splenic flexure; the splenic flexure and descending colon, sigmoid and rectum were empty of bismuth. The bowels had been open since yesterday's examination, but no blackened faeces had been passed; this was the only occasion the bowels had acted since the bismuth had been taken. The appearance of the transverse colon was very interesting; its right half was distended with bismuth food, the shadow then suddenly rose, narrowing the while, towards the umbilicus, and as sharply descended again, forming a well-marked "kink." It seemed to be fixed up in this abnormal position, and manipulation failed to move this "pinned up" portion to any appreciable extent, even when the patient was made to lie down on the X-ray couch.

Taking the patient's history into consideration—the very definite location of his colicky attacks, the very definite condition found in the X-ray examination, it seems practically certain that he has obstruction due to "kinking" of the transverse colon. I think a history of ten years' duration excludes a malignant cause. The stomach appearances suggested that adhesions might have followed healing of a gastric ulcer and caused kinking of the large gut.

Demonstrations.

(I) Dr. LEWIS JONES showed lantern slides of two cases of enlarged great-toe-joint, with considerable bony outgrowths around the joint.

(II) Mr. S. GILBERT SCOTT showed lantern slides illustrating the value of pyelo-radiography:—

- (1) One type of normal kidney pelvis.
- (2) A large normal pelvis (syphilitic kidney).
- (3) Hydronephrosis—unsuspected.
- (4) A single ureter with double pelvis.
- Same case { (5) Double ureter (complete) and pelvis on left side.
- (5A) Double ureter (complete) and pelvis on right side (with a tumour at lower pole).
- Same case { (6) Large single kidney on right side—diagnosed as an abdominal tumour.
- (6A) Same case showing absence of pelvis on the left side.
- (7) Kink in upper ureter, due to previous operation, showing commencing dilatation of pelvis (confirmed at operation).

The slides shown were a selection taken from those illustrating Mr. F. Kidd's paper, read before the Surgical Section on October 14, 1913, on "Pyelo-radiography."

(III) Dr. REGINALD MORTON showed a skiagram of early phthisis and one of bismuth in the stomach showing gastric ulcer.

(IV) Dr. IRONSIDE BRUCE showed lantern slides of skiagrams of :—

- (1) Extra lumbar vertebra.
- (2) Caries of the lumbar vertebræ: foci situated in the centre of the vertebral body; this escaped attention even at the autopsy until sections of the bone were cut.
- (3) Deposit of calcium carbonate distributed throughout the lung on both sides, some of which was coughed up periodically; the patient was a waiter and had never been out of England.

Electro-Therapeutical Section.

November 21, 1913.

Mr. C. THURSTAN HOLLAND, President of the Section, in the Chair.

Discussion on the Technique and Standardization of Bismuth Meals.

Opened by REGINALD MORTON, M.D.

THIS discussion is the outcome of a paper read by Dr. A. F. Hertz and a resolution passed in the Section of Electro-Therapeutics at the Annual Meeting of the British Medical Association last July.¹ This resolution expressed the desirability of adopting a standard meal for radiographic examination and suggested that this Section of the Royal Society of Medicine should appoint a committee to obtain evidence with a view to formulating this opaque meal—that is, a meal applicable for routine work and to be used in all but special conditions where some modification may be necessary.

For the purpose of opening this discussion I have been at some pains to find out the usual practice of as many radiologists as possible in dealing with routine cases, and I take this opportunity of cordially thanking all those who were so kind as to supply me with details. In tabulating these details a great diversity of opinion was evident, so diverse that the possibility of bringing them into line seemed very remote. On the other hand, if good work can be done with such wide variation in this detail, we learn that within reasonable limits the exact quantity and quality of the meal does not greatly signify. If we accept this as more or less true, then the greatest obstacle to the adoption of a standard opaque meal is removed. It may be urged that if good results are to be obtained with such differently constituted meals, why trouble about a standard at all? The answer to this is quite simple. We wish to get results that are comparable. Already

¹ *Brit. Med. Journ.*, 1913, ii, p. 928.

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we have too many factors in the case that are difficult or impossible to standardize and we should lose no opportunity of doing this where the possibility presents itself. We may say that the limitations of standardization limit the progress of medical science. As the matter in question stands at present we have every degree of variation from the 5-oz. meal containing 2 oz. of bismuth, or the 10-oz. meal with 4 oz., to the 20-oz. meal containing only $1\frac{1}{2}$ oz. This in itself is surely a strong argument for standardization.

In seeking information on this subject I specially asked for details on the following points:—

- (1) Total quantity.
- (2) Amount of bismuth or barium, which preferred and why?
- (3) Medium of suspension.
- (4) Consistency.
- (5) Flavouring, sugar, &c.
- (6) Preparation of the patient.
- (7) The most useful times of observation after the meal is taken, and any other details likely to be of assistance.

Of these seven points I regret to say that only one can be dismissed without further discussion. Everyone has agreed as to the use of sugar with or without other flavouring agents, and that everything should be done to make the meal palatable and attractive.

Total Quantity.—I find this varies from 5 oz. to 20 oz. The former is chosen as being an amount that everyone can take easily and provides a constant factor. Some of those who offer 20 oz. to their patients confess to the difficulty of getting them all to take the whole amount. At least half of those who have supplied me with details have adopted a 10-oz. meal. Dividing the sum of the total quantities by the number of individual observers gives an average of 13. The amount of bismuth or barium varies from 1 to 4 oz. with an average of 2 oz. Ignoring the difference in ounces by weight and by measure the percentage of the opaque salt to the total quantity varies from 10 to 40, with an average of 20, but the quantity of opaque salt is more important than the percentage it bears to the whole meal. I think it safe to say that whether we give a certain quantity of bismuth mixed with a small relatively dry meal, or with a larger and more diluted one, it is not long before the difference between them will be compensated for, either by the secretion of fluid for dilution in the one case, or by the absorption of excessive fluid in the other. Assuming this to be true, it helps us the more easily

to adjust whatever meal we may have fancied to a given standard. As for the choice between bismuth and barium, the majority continue to use bismuth; many are indifferent, and a small minority definitely prefer barium. Perhaps it is too soon to decide as to which is the better for routine use. The cost of bismuth to barium being roughly as a shilling to a penny gives the latter a strong claim, especially in hospital practice, but this difference in favour of barium is not so much as it seems to be at first sight.

Opacity to the X-rays depends on atomic weight, and with bismuth at about 210 and barium rather less than 140 it will surprise no one to hear that several observers have stated to me that they find it necessary to use from two to three times as much barium as bismuth to get the same opacity. In my own experience of barium I have always used the same weight as I do of bismuth, and I find that the shadows are more of the dark grey than the deep black given by bismuth. And not only is barium sulphate less opaque than bismuth carbonate or oxychloride, but it is actually twice the weight, bulk for bulk; this I consider a very serious objection to the use of barium sulphate. Its specific gravity is vastly different to that of the normal contents of the digestive tube, and when the large doses of opaque salt as used by some observers (4 oz. of bismuth carbonate or 10 oz. of barium sulphate) the objection is doubly serious. While I am prepared to concede that this may make little difference in the case of the stomach, and is a great help to observation of the duodenum, I want to learn just what happens when what is left of the original meal comes to be "banked up," as it were, in the last few inches of the ileum. Can we afford to add a dead weight of from 4 to 10 oz. to the normal contents of this part (an addition that makes little difference to the bulk) without risk of producing appearances that either have no existence in fact or are at least a great exaggeration of minor departures from the normal? The importance of this is greater when we remember that the tissues of a large proportion of those who come for this examination are in a soft, flabby condition and their intestines the less able to hold up against this weight. It is just possible that chemists may succeed in producing a lighter form of barium sulphate just as we have a light and a heavy carbonate of magnesium. A well-known firm of chemists has given us a light form of bismuth carbonate—so light that it remains suspended in water for a considerable time. I think it gives as dense a shadow as the ordinary carbonate and is certainly much better than barium in this way. Leaving aside the

influence on gastric contents, peristalsis, &c., I consider the position of bismuth carbonate in this lighter form is almost unassailable. Respecting this influence of barium and bismuth on peristalsis I hope we may hear something definite during this discussion. Most of those who have written to me have made no reference to it and others are not very sure, but the opinion that barium stimulates peristalsis is gaining ground; also it is said that bismuth carbonate completely neutralizes the gastric juice, which is not desirable. I am not aware that either of these objections has ever been made to the oxychloride of bismuth, and if the latter could be made in a lighter form it would be ideal for our purpose. Bulk for bulk it is quite 25 per cent. heavier than the ordinary carbonate.¹

In considering the amount of opaque salt to be used in a standard meal there is one possible factor that should not be lost sight of. I am convinced that individuals differ as regards the sensitiveness of the retina to the colour of the screen image, and because a few observers can see all they want with 1 oz. of barium sulphate, most others cannot do so. So while we should keep the amount of this foreign matter as small as possible, we must not make it so small that many observers are obliged to increase it. In certain cases we can get all the information required with quite a small dose of bismuth, but for the purposes of a standard meal 1 oz. is too small. Two ounces are not only the average amount, it is the actual amount most commonly used by radiologists in this country, and it seems a very suitable one from every point of view.

Medium of Suspension.—At least two-thirds of those who have supplied me with details use bread and milk. A few use porridge, which is at least as good but not so easily and quickly prepared. Others make it up in blanc-mange or jelly, and others again give it in an emulsion with lactose. Emulsions bear little resemblance to an ordinary meal, but if given shortly after the latter and means be taken to ensure its mixing with the stomach contents, it must be admitted that the objections to this form of administration largely disappear, and it might be useful for out-patients who occasionally have to be examined on short notice and without preparation. In France gum solutions are much used for suspension, and in America thick butter-milk is popular, but these are hardly likely to find favour here. To the use of porridge, cornflour, arrowroot and such-like media there can

¹ Equal bulks were weighed carefully: bismuth carbonate, 503 gr.; bismuth oxychloride, 643 gr.; barium sulphate, 1,000 gr.

be no objection. They are palatable to most people and give a most perfect suspension; but none of them is so easily and quickly prepared as bread and milk. Doubtless it is for this reason that the latter is so popular and consequently likely to survive.

In the matter of *consistency*, leaving emulsions and jellies out of account, there is very general agreement. "As thick as porridge" is the usual description.

Method of Preparation.—This naturally varies with the medium of suspension. Taking bread and milk as the most usual one, the opaque salt is mixed in last; this makes a "messy" meal but it is probably the most often done. A better way is to have the bread cut in small cubes, placed in a bowl and the hot milk poured over. The bismuth may be mixed with the milk before pouring it over the bread, or we may have it prepared in the form of a tasteless and odourless emulsion which is poured over the bread and milk last of all. Either of these methods leaves the bread whole and it certainly looks more attractive.

Taking an average of such details that can be averaged, and going by the majority where this cannot be done, we arrive at a meal having a total bulk of 13 oz., containing $2\frac{1}{4}$ oz. of bismuth salt in bread and milk of the consistency of porridge.

If I were asked to construct a standard meal on this basis, but adopting convenient weights and measures, and acting upon suggestions I have received regarding preparation and so on, it would read something like this: Into the bowl from which the meal is to be taken are placed 2 oz. of white bread (without crust) cut into small cubes about the size of dice; 8 oz. of milk are boiled in a saucepan, and into this are stirred 2 oz. of bismuth carbonate or oxychloride (or 3 oz. of pure barium sulphate). While still stirring the mixture is poured over the bread, and after it has cooled sufficiently sugar is added to taste and the meal is ready. I suggest this as a possible basis for negotiation and agreement.

Preparation of the Patient.—Some of those who have written to me omitted to say anything about this. Of those who have done so, the majority have their patients prepared as for an anæsthetic. Some require abstinence from food until all the meal has left the stomach; others say the patient's usual habits, before as well as after the examination, are not to be interfered with in any way. With such diverse views it is to be hoped the spirit of compromise may be abroad when an attempt is made to settle this question. If I were to act upon what

appear to me to be the good points of the various ideas that have been expressed, my procedure would be to order an aperient to be taken about thirty-six hours before the examination ; the rectum to be cleared out with an enema early in the morning, and the bismuth meal to take the place of the patient's breakfast—except perhaps for a cup of tea or hot milk in the interval if circumstances indicate it, and the examination cannot be arranged to begin quite early in the forenoon.

Except in special cases the patient should continue his usual habits as to meals, but the first one after the bismuth should not be sooner than four hours. I take the view that while some preparation is necessary, we should avoid making the conditions during the examination unduly artificial.

As for the most useful times of observation after the first one when the meal is given, details are rather incomplete. This is probably because so much depends on the circumstances of each case, but the general opinion is that during the first few hours the most important information is gained, and within reasonable limits the observations should be frequent. The stomach and duodenum have been described as the " storm centre " of the digestive system, and this part always demands careful attention. After the meal has reached the large intestine it is practically impossible to work to a time-table. The " mass movement," which seems to be the normal method of progression here, makes any such effort futile to a large extent. It is thus difficult to lay down any definite rules, but observations at two, four, six, twelve, twenty-four, and thirty-six hours very fairly represent the practice of those who have given details on this matter.

As one of our members has truly said, the adoption of a standard opaque meal and a uniform procedure will not provide a short cut to the diagnosis of digestive disease, but most of us will agree as to the desirability of uniformity in the meal we use for this method of examination and so obtain results that are comparable.

The talk about the disagreement of doctors is an ancient gibe, but the truth of it was never more in evidence than when I came to tabulate the details of these bismuth meals.

Dr. ARTHUR F. HERTZ sent the following contribution :—

(1) *The Salt employed.*—Large doses of *bismuth subnitrate* ought never to be employed for X-ray examinations, as the salt may give rise to severe poisoning, which has ended fatally on several occasions. As the peristalsis of the stomach, and to a still greater degree the control of

its evacuation by variations in the tone of the pylorus depend upon the presence of free and organically combined hydrochloric acid, *bismuth carbonate*, which neutralizes every trace of both, is not a suitable preparation for X-ray investigations of the stomach. Its depressing effect on gastric peristalsis can be readily demonstrated by giving a patient on consecutive days a bismuth meal of identical composition, except that the oxychloride is used one day and the carbonate the other. In two healthy individuals examined in this way for me by Mr. Depree, who did not know which salt was used on either occasion, the peristalsis was recognized by him as being very much more powerful with the oxychloride than with the carbonate. In February, 1908, I began to use, at Mr. H. Finnemore's suggestion, *bismuth oxychloride*, which is produced in the stomach when the carbonate is given, as this is the only salt of bismuth which is chemically inert in the stomach. A very small quantity combines with sulphuretted hydrogen in the colon, but most is excreted unchanged. Numerous experiments have convinced me that bismuth oxychloride does not interfere with the motor functions of the alimentary canal, except in those cases of diarrhoea in which excess of sulphuretted hydrogen has developed as a result of abnormal putrefaction; this gas is a powerful stimulant to the intestinal movements, but is rendered inert by combining with bismuth. *Barium sulphate* has now been proved to be as efficacious as salts of bismuth in rendering the stomach and intestines visible in X-ray examinations. It is completely insoluble in water and in acids, and no organic substances act upon it. Sulphuretted hydrogen has no action upon barium sulphate, which passes through the whole alimentary canal without undergoing any chemical change. The disadvantage in using salts of bismuth in the investigation of cases of diarrhoea associated with excessive formation of sulphuretted hydrogen is therefore not present when barium sulphate is used. Its cost is now 1s. 2d. per lb., and Mr. H. Finnemore, the Chief Dispenser at Guy's Hospital, tells us that it could easily be made for only 4d. per lb., as compared with 8s. 4d. per lb., which is the lowest price for bismuth salts. I have never heard any reason for preferring bismuth salts; its much greater cheapness, and the fact that it is completely inert in the alimentary canal even in those cases of diarrhoea which are arrested by bismuth salts, make it desirable that barium sulphate should be universally adopted. I have myself used it for two years with perfectly satisfactory results.

(2) *Dose of the Salt.*—Dr. C. H. Rippmann and I have found that the distortion produced by the weight of 2 oz. of bismuth oxychloride

or barium sulphate in the normal stomach is almost negligible, but with 4 or 6 oz. the greater curvature is definitely depressed in the vertical position. The distortion produced by large doses of salts is much more obvious in cases of atonic dilatation of the stomach, and it is therefore obvious that the smallest dose, which gives a clear view of the organ, should be used. Excessive doses produce displacement of the end of the ileum and possibly of the cæcum, as it is obvious that the addition of 6 oz. of a heavy powder to their normal contents must drag them downwards. I almost invariably use 2 oz. of barium sulphate, as except in very thin individuals a smaller quantity does not give a sufficiently clear view, and this dose produces a quite insignificant distortion, even in cases of well-marked atony of the stomach. I give 3 or 4 oz. to very stout patients, as adipose tissue is relatively opaque to the rays, and it is impossible to make a satisfactory examination of the stomach and intestines with the ordinary dose.

(3) *Bulk of the Meal*.—The appearance of the stomach varies greatly according to the amount of food which is present in it. In order to obtain comparable results the bulk of the meal should therefore always be the same. Theoretically it would be desirable to give a quantity equal to an ordinary meal. But as many of the patients are examined on account of indigestion, which is often accompanied by more or less severe anorexia, and as the meal—however well prepared—can never be really attractive, it is best to adopt a small bulk as a standard, so that every patient is able to take the whole of it. The mixture I use measures 5 oz. without the barium sulphate.

(4) *Nature of the Meal*.—Observations on human beings as well as on animals show that the movements of the stomach are more active if food is eaten with appetite and enjoyment than if it is distasteful and taken as an unpleasant necessity. It is therefore most important that the mixture should be palatable and well made. It should, moreover, be of such a consistence that it makes a good suspension of the barium sulphate, as the whole outline and the upper limit of the gastric contents can then be clearly seen instead of only the more dependent part, into which the salt otherwise falls. For both reasons I find porridge better than bread and milk, which in turn is much superior to a suspension in water with lactose. I now always use a mixture of 2 oz. of barium sulphate with 4 oz. of porridge made from fine oatmeal and 1 oz. of milk, to which as much brown sugar is added as the patient likes. Very few patients dislike the meal; several, indeed, have stated that it compared very favourably with mixtures they had previously had both

in England and abroad, the mixture with lactose and water being particularly nasty.

(5) *Preparation for the Examination.*—Most cases of constipation are more or less cumulative, the bowels never being completely evacuated, so that more and more fæces are retained. In dyschezia, for example, fæces collect in the rectum or pelvic colon and the accumulation gradually increases from below upwards. It is consequently possible for partial obstruction to occur in the higher parts of the colon as a result of fæcal accumulation, although the motor functions of the intestine as far as the pelvi-rectal flexure may be normal. For this reason it is only after the colon has been properly emptied that the activity of all parts of the intestines can be properly investigated. Neglect of this precaution has frequently led to the diagnosis of stasis or even organic obstruction in the descending colon or splenic flexure, or less frequently in the transverse colon, when none was really present. An attempt should be made to obtain a thorough evacuation of the bowels by aperients or enemata or both on two consecutive days, on the third and fourth mornings an enema should be given but no aperient, and on the last of these the barium breakfast is taken. It is very important to discontinue the use of all aperients for at least forty-eight hours before the first examination, as the intestinal functions might otherwise be observed whilst still under their influence instead of under natural conditions. No aperients and no enemata should be used till the examination is finished, but the patient should make an attempt each morning to open the bowels naturally. If the attempt is successful the stools should be examined in order to ascertain whether any of the salt has been evacuated. During the whole period of the examination the patient should follow his usual occupations and take his ordinary diet, in order that the activity of the bowels may be investigated under natural conditions.

In order to make a satisfactory examination of the stomach it is essential that it should be empty when the barium meal is eaten. The patient should therefore be examined, when possible, first thing in the morning before any food is taken; when this is impracticable, he may have a cup of tea and a single slice of bread and butter early in the morning, but nothing at all within three hours of the X-ray examination. If there is any possibility that gastric stasis is present the second examination should be made as nearly as possible six hours after the first and nothing should be eaten and drunk during the interval. If, however, the meal is eaten at 10 a.m. and lunch is taken at 1 p.m., the latter becomes thoroughly mixed with the small quantity of barium and food

which is normally still present in the stomach. Instead of all the barium being evacuated by 2 p.m., some will still be present two or three hours later, when it will again be mixed with the food, if tea is now taken. At 6 p.m., therefore, eight hours after the barium meal, a small shadow may still be seen, as I have found by actual experience in normal individuals, and if dinner is taken between 7 p.m. and 8 p.m. the last trace of barium will not be evacuated until midnight or later. I have repeatedly seen a diagnosis of gastric stasis made because a shadow was still present in the stomach six or more hours after a bismuth or barium meal, although this was perfectly normal, as more food had been given in the interval, and a subsequent examination, in which this source of error was avoided, showed that the stomach emptied itself in the normal time.

When there is no question of gastric stasis the ordinary meals may be taken, and the second examination can be made between six and ten hours after the first. An examination should be made in the morning and evening of each subsequent day until all or most of the barium sulphate has been passed in the fæces or has reached the rectum. The examination can often be completed in three days, but in cases of severe constipation it is occasionally necessary to examine the patient on as many as five consecutive days.

Dr. ALDRIDGE said that as the method of giving bismuth meals which he had carried out for two years had not been mentioned in the two papers, he wished to lay it before the meeting, so that other radiographers could comment on it. Most of the bismuth meals he had given had been to hospital patients, and the arrangements of hospital were such that it was difficult to examine every two hours. The object of the meal had mostly been to determine the condition of stomach and duodenum. His method was to give a double bismuth meal—namely, 2 oz. of bismuth carbonate about 9 a.m., an aperient having been administered the previous night, and an enema the morning of the examination. The examination six hours after the meal would indicate stasis or otherwise. At the same sitting a second meal was given, and this enabled observations to be made on the shape and motility of the stomach. He had not to deal so often with cases of intestinal stasis, but in these cases when necessary subsequent observations could be made. Patients took carbonate of bismuth well in cornflour; it was usually preferred to oatmeal, Benger's food, or bread and milk.

Dr. A. E. BARCLAY desired, first, to congratulate Dr. Reginald Morton on his excellent résumé of the subject, and on having evolved a standard meal from the data he had been able to collect. He was very glad to notice the opener referred to an "opaque meal," rather than using the general term "bismuth meal," and he hoped the former term would become the usual one. A standard meal was very nice in theory, it was easy when matters could be reduced to $x + y = z$; but, unfortunately, we did not all have standard normal stomachs; they were even more variable than any other organ in the body. In his experience, one must judge whether a particular stomach was normal not so much by the quantity or quality of food put into it, as by the action of the stomach walls, the way in which food entered the stomach and was held up or allowed to travel down, the character of the peristalsis, and a number of other points. Every member would agree with the requirement that the standard meal must be as palatable as possible. People's tastes differed, hence the vehicle for the meal should also vary. If anything unpalatable were given, there would be a tendency to atony and the stomach would appear abnormal. In the cases where there was much fat in the abdominal walls, a meal of extra opacity must be given in order to bring out a distinct shadow. He found that the samples of bismuth supplied to his hospital varied within very wide limits, as regards its specific gravity and characteristics, but he would remind one of the speakers that the difference in weight between a pound of lead and a pound of feathers should be kept in mind. He did not know whether the light variety mentioned by Dr. Morton was mixed with lycopodium.

He was quite sure, as an absolute fact, that bismuth carbonate did not neutralize gastric juice. He believed that his own were the original observations on secretion as detected radiographically, and all these observations had been made with bismuth carbonate. He had more recently used the barium sulphate and had confirmed all the original observations he had made with bismuth carbonate. There seemed to be little, if any, difference between these two salts in this respect. Why the carbonate should not neutralize the acid he did not know, but the fact remained that after a carbonate meal we could practically invariably get some evolution of CO_2 by giving a dose of sodium bicarbonate, and if there was hypersecretion of a very acid nature, although the *Magenblase* remained constant after the carbonate meal and showed no tendency to increase, yet, on giving a dose of the sodium bicarbonate there was immediate evolution of CO_2 and increase in the size of the *Magenblase*, sometimes as much as $1\frac{1}{2}$ in. in depth being given off.

With regard to Dr. Morton's method of making the meal, he (the speaker) contended it was dangerous to use lumps of bread, because those pieces, when inside the alimentary canal, might be mistaken for cancer.

His own essentials for a bismuth meal were, that it should be palatable, it must be as light as is consistent with opacity, and it must be a carbohydrate meal, because all radiographers were working with carbohydrate, and if proteid and fat were added, various factors were disturbed, and there was not the same reliability of results.

Dr. W. J. S. BYTHELL said he dissented from some of the suggestions made by Dr. Morton. So long as the meal was palatable it did not matter what food was the vehicle; the patient must not be nauseated. Except financially he did not think it mattered whether bismuth or barium was used. He used an ordinary sized teacup half full of porridge, filled it up with bismuth or barium, and mixed. The consistency should be that of porridge. The most important item in the technique was the amount given. He always examined his patients in the upright position, and a preliminary examination was important to note the position and movement of the diaphragm, and the amount of fluid in the stomach. It was useless to instruct the patient to take the bismuth before he came, because the radiographer should watch the stomach when two or three spoonfuls had been taken. Nothing showed better the tone than a small quantity of the mixture, and the stomach should therefore be looked at immediately after the patient had eaten a small amount. There should be no lumps in the food, or there might be produced a mottled shadow, which might mislead the observer in the diagnosis; he might think there was an ulcer or a spasmodic contraction. For the same reason the stomach should be empty, if possible, when the examination was begun. For ordinary examinations he did not think more than a teacupful should be given—i.e., between 5 and 6 fluid ounces. It was important to verify one's examination on a subsequent occasion. If it was decided that a special point required to be determined, the patient could be directed to have his bismuth six or eight hours before examination. It was most important to see the patient during an attack. In an ordinary gastric or duodenal case it was useless to examine during a quiescent period; there might be a two or three weeks' interval between attacks. Recently a child, aged 8, was sent to him for examination. There was a history of intermittent attacks of pain and vomiting, lasting several

days. During the intervals there was comparative freedom from the symptoms. She was first sent to him during a quiescent period and he gave bismuth oxychloride. The only thing wrong which he noticed was a greatly exaggerated peristalsis, enormous waves passed down the greater curvature, and the bismuth shot through the pylorus before she had finished her meal. On the strength of that he suggested to the physician that probably there was intermittent pyloric obstruction. He arranged that she should come again during an attack. She did so, having taken bismuth five hours before. He found the stomach full of bismuth, and practically none had passed through the pylorus, though on this second occasion the peristalsis was even more violent than on the first. He had seen many cases which enforced the same lesson. If it was intended to give a meal of 13 oz., or even 20 oz., it was very important to make an examination of the stomach before it became over-distended; so much bismuth would produce a very misleading picture. There were other reasons why the stomach should not be overloaded. By personal experiment he had found it was easy to abolish a small spasmodic contraction due to an ulcer half-way down the lesser curvature by filling up the stomach to that extent. If there were a growth on the posterior wall and only 5 or 6 oz. had been given, the slightest manipulation of the stomach would show that the bismuth at that point was thinner than at any other part of the stomach; or the growth might come through the bismuth. But if a pint of food were put into the stomach it would be almost impossible to get any indication of such a growth. It was important first to examine the stomach when it was only moderately full. After the examination of the stomach was concluded more bismuth could, of course, be given if desired, in order to see the intestines to the best advantage.

Dr. IRONSIDE BRUCE said he made the statement a long time ago that whatever the meal given it should be palatable: there was not likely to be disagreement on that. He went further, and saw to it that the meal was properly served. At breakfast time, especially, if the patient was a dyspeptic, this was of great importance. As a rule he used bread and milk. The bread was cut into quite small cubes and placed in the bottom of the dish, and boiling milk poured over the bread. The bismuth (emulsion used) should be tasteless and free from all smell. He kept 1 oz. of bismuth carbonate as an emulsion in a 3-oz. bottle (for convenience of shaking up) and that was added to the bread and milk. It could be added outside the room, so that the patient

did not see it done. Sometimes the patient, not knowing it was the complete meal, asked, What about the bismuth? When the patient did not like bread and milk he had tried oatmeal porridge, in the Scotch way, the milk being taken separately from the porridge. The bismuth in that case was taken in the milk. The periods of examination he adopted were immediately, and at the fourth, eighth, twenty-fourth, and thirty-sixth hours. When the food reached the large intestine those times could be varied, but he was particular in telling the patients to resume their ordinary food. He got them to take a purgative two nights before the examination, and resume their ordinary food the next day; that was necessary if the intestinal tract was to be rendered as normal as possible. He made up his meal to 10 oz. and found no difficulty about this. He agreed that the radiographer should watch the food swallowed and enter the stomach; this should be done as a routine practice. He hoped a committee would be appointed to arrive at some sort of standard on this important matter.

Mr. HIGHAM COOPER wished to detail some of his findings in examinations of the normal—i.e., in students and others who appeared to be in normal health—and also in animals. Bismuth oxycarbonate did not appear to neutralize the acid in the stomach; that was found by withdrawing the food at intervals. The quantity of food given made a considerable difference to the time occupied by the stomach in emptying, a point which had not, so far, been mentioned. A student who took half a pint of the food had his stomach empty in three hours, whereas with a pint of the same food it took four hours to empty. The only food he found at all uniformly digested by people in normal health was milk, with bread, groats, or anything else, the milk also having the advantage of entangling the bismuth in a clot. Beef extracts, minced beef, &c., were differently dealt with by various persons. The most suitable meal to give a patient was, he thought, a pint of bread and milk, of the consistence of porridge, not with the bread in pieces, and containing $1\frac{1}{2}$ to 2 oz. of bismuth oxycarbonate or oxychloride; he thought it made no difference which salt was used. Often it was most useful to observe the patient in the act of swallowing the meal, though in hospital it was advisable to place a towel over one's head while making this observation. He examined the person in the standing position, and lying, to see how much difference there was in the position of the stomach. He examined again at two hours and four hours, and, if the stomach was not empty by then, at six hours. After that he allowed

ordinary food, whether the stomach was empty or not. It made a difference of two hours in arrival of the meal at the sigmoid flexure compared with the delaying of food until eight hours after the meal.

Dr. J. A. Codd said his usual practice had been to give 2 oz. of oxychloride of bismuth with 20 oz. of bread and milk, made into a paste. He feared he had not given sufficient attention to making the meal palatable, as he had not provided sugar, and there had been reluctance in some cases in taking it. His plan had been to tell the patient not to take breakfast, but to clear the bowels out previously, and not to take food until four hours after having the bismuth meal and after the second examination. After that he could take what he fancied. Two ounces of bismuth in 20 oz. of bread and milk showed up the stomach very well. But in following the meal through the rest of the tract he found it apt to get very diffuse and so less easy to locate; sometimes he could see nothing but greyish little patches, spread over large areas. Two ounces of bismuth oxychloride in a 10-oz. meal would, he thought, give better results. For œsophageal obstruction cases he had recently, at the suggestion of Dr. Finzi, used thick oxychloride paste instead of the usual meal, and this had improved the definition very much, and as a result of this he had been led to think that a more concentrated meal would give better results. It would also be of great value if collective investigation could establish the average time that the normal stomach took to empty; it would greatly help a judgment as to whether stasis was present or not. There must be wide differences in regard to the intestinal tract as a whole. He had noticed the great frequency with which one saw marked ptosis of the transverse colon; he believed he found the transverse colon just over the pubes as often as he saw it in the normal position. One could see the food going right across in an oblique fashion from the ileo-cæcal position to the splenic flexure, and then continuing downwards. Was that due to the heavy bismuth meal? If so, would not that tendency be increased if barium were used? Taking into consideration the relative specific gravities, bismuth apparently had four times the opacity of barium. He believed that if one used a very light form of bismuth carbonate, a given bulk would not give anything like so dense a shadow as the more dense preparation.

Dr. FRED. BAILEY said he considered a purgative two days before the examination advisable, and that the first meal on the day of examination should be the "opaque" meal. A bulky meal was not desirable;

he gave 3 oz. of bismuth oxychloride mixed in half a breakfast-cupful of cornflour ; hot milk was added with sufficient sugar, and the whole amount made up to about 8 or 9 oz. by measure. He examined the patient in the diascope before giving the "opaque" meal : this was very important. The act of swallowing the first portion was carefully watched, and the way the bismuth entered and opened up the stomach noted. More hot milk could be given if the bulk of the meal seemed too small. He would not give two "opaque" meals, as advocated by one speaker, because of the liability of getting confusing shadows. He took photographs where necessary to clear up doubtful points. After the diascope examination he examined the patient on the couch, first turning him on the right side if necessary. He liked to examine him again by the diascope five hours after, and not to allow the patient a meal until after the second examination. Doubtful points could often be settled by alteration of position or by massage, either in the upright or reclining position. The most valuable photographs were often those taken with the patient lying on his abdomen with the thorax and pelvis slightly elevated, the tube being above the patient and plate beneath. Further examinations at intervals were carried out during the next forty-eight hours.

Dr. G. B. BATTEN said the meal he used in private practice was 2 oz. bismuth carbonate, 3 oz. sugar of milk, in a red tumbler which was filled up with milk, preferably Horlick's. He gave it in a room illuminated with artificial light, tinged with purple blue. At Wiesbaden, sometimes instead of giving a double opaque meal by the mouth, one meal was given in that way ; an attendant was present at the same time to inject a still larger quantity *per rectum*, and a skiagram was taken of the whole tract.

The PRESIDENT (Mr. Thurstan Holland) said that many interesting points had arisen in the discussion. Some of the remarks had been somewhat wide of the subject announced, and dealt with stomach examination as such, rather than the standard meal. It was likely to be difficult to reconcile the work of different radiographers. One speaker did not seem to think it mattered what vehicle was used for the opaque substance, or the quantity given, or whether bismuth or barium was employed, while others carefully measured the quantity given, and were particular as to the food in which it was suspended. Dr. Jordan was in the habit of giving a large amount of bismuth, while others favoured a small dose. Even two radiographers, working in the same institution,

did not agree in their ideas or methods ; so it was not surprising to find still greater differences taking the country through. He had given Dr. Morton, before he wrote his paper, the test meal he employed, and if the Section should decide in favour of that he would be glad ; but if it did not, it was likely he would still go on using it, for he found it suited his methods of examination. Probably other workers would adopt the same attitude. But there could be no objection to the appointment of a Committee on the subject, the result of whose deliberations might be to smooth away many points of difference, and approach much nearer to a standard than present practice revealed.

Dr. REGINALD MORTON, in reply, admitted the difficulty of reconciling the various ideas and methods, but would like to submit a straight question. Some used a small meal, some preferred a large one, and each contended that his method was the best : was any member prepared to say that another man was not getting as good results as he was himself ? It was well known that good results were being obtained with almost any size of meal, palatably given ; but the great point for which he was contending was that there should be results which were strictly comparable, and this could not obtain where there was such diversity of practice. Standardization would mean something like uniformity of interpretation, though he fully admitted the meal must be increased in the case of obese people. When he came to tabulate the data supplied him by men throughout the country he was appalled by the differences, and yet each man was getting good results. He admitted that one could not expect absolutely to standardize anything, but by exercising a spirit of compromise much could be done towards uniformity of practice. In his opening paper he said it had been stated that bismuth carbonate completely neutralized the gastric juice, and Dr. Hertz made the same statement ; but Dr. Barclay and Dr. Cooper said that it was not so. He did not think Dr. Hertz would make that statement without having good grounds for it, but such a question was one for scientific determination by such a Committee as he proposed. He was sorry Dr. Jordan was not present at that meeting, as he had stated that the action of neutralizing the gastric juice was important because it tended to relax the pylorus so that there was a strong flow of the bismuth into the duodenum, and he could see the duodenum much more clearly in consequence. With regard to the light form of bismuth carbonate, he was called on by a representative of the firm of chemists he had in mind, who assured him

that the sample with which he had worked was pure carbonate of bismuth. It appeared that the manufacturers of bismuth salts were often troubled about their carbonates, for occasionally it would come out light, at other times heavy, and magnesia was a parallel case. The firm claimed they could secure a very light carbonate by precipitating it with very active agitation. Still, one felt that the opacity of a light powder would be less than the heavy form, though he had found there was no material difference in the readings. If one used exactly the same weights of barium sulphate and bismuth carbonate, the barium shadows were not so densely black as the bismuth ones. If his own stomach were out of order, and he were asked to take a pint of opaque meal, he would raise strong objections. He had found that only two people out of ten took the pint meal when requested without any objection. Since he adopted a maximum of 10 oz. very few failed to take the whole of it. With regard to the stimulating action on the colon of food taken into the stomach, members would be familiar with this, especially in the case of infants. This was another reason why, after a certain interval, patients should resume their ordinary food. It had been said that the small cubes of bread might, when in the stomach, be taken for carcinoma, but he did not regard that as a danger, for the hot milk poured on the bread, and the mastication of the patient, would cause the mass to be of uniform consistence by the time it reached the stomach.

He concluded by repeating his motion for the formation of a Committee of the Section to deal with the matter, and asked that Dr. Hertz be appointed thereon, on account of the work he had done in connexion with the subject. If a spirit of compromise were shown, he believed it possible to arrive at a good working agreement.

Dr. HARRISON ORTON seconded the motion and it was carried.

The gentlemen appointed were Dr. Hertz, Dr. Reginald Morton, Dr. Gilbert Scott, Dr. Barclay, Dr. Jordan, the Committee having power to add to their number.

Electro=Therapeutical Section.

January 16, 1914.¹

Mr. C. THURSTAN HOLLAND, President of the Section, in the Chair.

History of the X-ray Department at St. Thomas's Hospital.

By A. D. REID.

THE first arrangement for radiography at this Hospital was made in 1897, when the engineer's shop in the basement was utilized for installing first of all a 2-in. and then a 6-in. coil with a small portable tube stand, the electrical energy being derived from a 24-volt accumulator which could not be recharged at the Hospital. The space was so limited that when the couch (ordinary consulting room type) was in the room there was hardly space for patient and operator. No protection devices were used at all. The Department was put in charge of Dr. Blacker, and on his unfortunate death Dr. Greg was appointed, and the work having increased from about 797 in 1908 to 1,253 cases in 1909, a move was made to the site of the present Department.

The Department possessed in the way of apparatus two Miller induction coils, one 12-in. for radiography and the other 10-in. for treatment, a simple tube stand (which at first offered no protection to the operator, but afterwards a lead glass bowl was used to enclose the tube), and a small hand screen. The coil was used from a 65-volt direct current motor generator, the latter being derived from the alternating current mains, and the greatest output it was capable of was about $1\frac{1}{2}$ ma. through a medium vacuum tube. Practically no radiographical examinations of chest and abdomen were done during that period. There was very little X-ray treatment and even that was of a very rough-and-ready description, because, until comparatively recently, no approach to accuracy of X-ray dosage was possible. The number of people employed under Dr. Greg consisted of one assistant and two

¹ Meeting held at St. Thomas's Hospital.

nurses. In 1911 Dr. Greg resigned, and in January, 1912, Mr. Reid, on being appointed, undertook the task of completely reorganizing the Department. The original large room set apart for radiography has been divided into two, the larger half being equipped with a modern 16-in. coil worked from the direct-current mains at 220 volts by means of an elaborate switchboard. The tube is now enclosed by an ample protection shield capable of taking compressor diaphragms of various sizes and fitted with stereoscopic and self-centring plate-board capable of being used underneath a special X-ray couch when necessary. The whole of this apparatus has been designed so that ward patients can be sent down to the Department in their beds, and the bed being wheeled under the compressor, negatives can be taken of most parts of the body with the minimum of discomfort and inconvenience to the patient. The smaller room has been made light-tight, and contains an elaborate screening apparatus fitted with a rotating turntable, by means of which the patient, either seated or standing up, can be examined in any position with the least possible trouble. In addition, by means of special cassettes and a tube shift, both worked by electro-magneto, it is possible to obtain stereoscopic radiograms of the chest and abdomen in about two seconds. This apparatus, as well as a large negative examining box and a stereoscope, was erected during the middle part of 1912, and the first radiograms under the new régime were taken on September 1.

Two X-ray treatment cubicles, on similar lines to those at present used in the London Hospital, were erected at the end of the year and were in full working order in January, 1913.

In addition to what has already been mentioned, the Department consists of a large dark room and workshop, Mr. Reid's private room, two Finsen lamps, one quartz lamp, one lamp for ultra-violet rays, and a mercury vapour lamp and camera used for reducing large negatives to smaller sizes. In this Hospital every case requiring radiographical examination is sent down to the Department, there being no Casualty X-ray Department because, after long discussion of the subject, it was thought better for various reasons not to adopt the plan used in some other hospitals of having separate departments—one for casualty work and one for ward work. Thus, as stated before, bad casualty cases and ward cases are conveyed down by lifts to the Department, there to receive the necessary investigations. In cases of patients requiring X-ray examination of the stomach and chest, and who are unable to stand or sit, the usual procedure is to remove the patient to a special X-ray couch, which is then wheeled into the screening room, and the

examination is conducted with the patient lying on his back, the tube being below, and the examining screen or plate being above the patient. This method of examination is only used in exceptional circumstances. Radiograms of the limbs are always taken by using the compressor tube and pads to immobilize the part, the tube thus being above and the plate below the patient.

The method of storing and classification of negatives is as follows: Every case is given a number which is entered in a book, together with the name of the patient. A card index is used, in which the region of the body to be radiographed is divided into eleven divisions. A twelfth division is used for "foreign bodies" present in any part of the body. For instance, in the case of an injury to the shoulder, the patient's name is entered in the book, together with his number and date; these are then copied on a card bearing a small tab designated by the proper number corresponding to the part of the body radiographed (which in this case is No. 3), and the other details are then filled in on the card—such as the ward, the name of the physician, the age of the patient, and the clinical diagnosis. The plates of the cases are all examined at the end of the day, and the cards filled in with the X-ray opinion of the case. When dry the negatives are sent to the physician or surgeon in charge of the case in large bags with the diagnosis written on the envelope, and, on being returned to the Department, are stored in pigeon-holes in their proper order. All interesting cases are specially marked, so that it is quite easy to investigate any series of cases which may be required.

At the present time working in the Department are three qualified clinical assistants, two other assistants, and one developer. The nursing staff consists of a sister and two nurses.

Summary of Work in the X-ray Department at St. Thomas's Hospital for the Year 1913.

By C. GOULDESBROUGH, M.B.

THE number of cases in the Department per year has risen from 797 in 1908 to 6,475 in 1912. The following is the list of cases treated during 1913:—

Number of radiographical examinations	...	...	...	...	6,501
Number of X-ray treatment cases	...	...	...	...	68
Number of dermatological cases treated by X-rays	...	...	...	...	541
Number of electro-therapeutical cases	...	...	...	...	500

It has been impossible in the short time since the end of the year to give the complete analysis of the 6,501 cases, and the remarks that follow are simply made to draw attention to a few of the most interesting points in the cases for the year. In addition to the ordinary cases the Radiographical Department has examined the cases of injury or disease occurring in the Metropolitan Police, which amount to forty-eight cases, and also ninety-nine cases of early phthisis of the chest in connexion with the Tuberculosis Department, the latter being undertaken with a view of finding out, if possible, what is the value of the X-ray evidence as regards the early manifestations of this disease. The result of this inquiry, worked out for the first fifty cases, has been rather disappointing in point of view of the statements made by some radiologists as regards the diagnostic value of X-rays in the early stages of this disease. In view of the interest which has been shown lately in this important subject, the figures of these fifty cases are here written down from the report compiled by Dr. Wingfield, Superintendent of the Tuberculosis Department, and, as will be seen, the report is divided into two parts—one corresponding to the observation of movements of the diaphragm, and the other to deductions from the shadows seen in the chest, as judged from plate and screen examinations.

(I) DIAPHRAGM EXCURSION.

	Per cent.
Diaphragm agreeing with physical signs	42
Diaphragm, the only abnormality no shadows or physical signs ...	10
Diaphragm excursion definitely differing from the physical signs ...	26
Diaphragm movements equal on the two sides with disease found ...	22
	100

(II) CHEST SHADOWS.

(1) Shadows agreeing with physical signs	44	} 66
(2) Shadows agreeing with physical signs, but showing more disease	14	
(3) Shadows agreeing with physical signs, but showing less disease ...	6	
(4) Shadows without any physical signs	2	
(5) Shadows definitely differing from physical signs	24	
(6) No physical signs and no shadows	10	
	100	

Apart from this subject the following cases of interest have been noted from a superficial examination of the cards.

(I) RADIOGRAPHY.

Number of chest examinations, 378; number of abdominal examinations, 196. Seven cases of undoubted enlargement of the sella turcica; one case of a safety-pin embedded at the bifurcation of the trachea; one

case of a bullet lodged in the dorsal spine, the bullet being located in the spinal canal by X-rays and abstracted by the surgeon (? murder or suicide); a case of retropharyngeal abscess before and after treatment; one case of enlarged thymus; a fracture of every carpal bone of the wrist except trapezium and trapezoid; dislocation of semi-lunar bone of the wrist *per se*; several cases of bilocular stomach, none of which have been diagnosed clinically; one case of undoubted obstruction in the cæcum; four cases of fracture of spine; one case of an extraordinary abnormality of the lower cervical and upper one or two dorsal vertebræ believed to be a spina bifida in that situation.

(II) X-RAY TREATMENT.

Carcinoma: Five improved, still under treatment; one improved but ceased attending; ten did not improve, of whom four have died.

(A) *Inoperable Cases.* — Here the principle has been to give the patient as much X-rays as the skin will stand or as time will allow; $\frac{1}{2}$ and 1-mm. filters have been generally used and pastille doses given measured under the filter. The use of thicker filters is impracticable with the apparatus at our disposal owing to the length of time spent in reaching a pastille dose under a 2 or 3-mm. filter. We use tubes as high as possible and have worked out a table showing the percentage of rays absorbed by filters of $\frac{1}{4}$, $\frac{1}{2}$, and 1 mm. aluminium from rays of different penetration. In this way, knowing the number of interruptions required by a given tube to turn an unprotected pastille, one can dispense with pastilles when giving filtered doses, as extreme accuracy is unnecessary. When the condition has not been too hopeless considerable improvement has resulted. As an example I quote this case: The patient is a woman, aged 54, under Mr. Robinson's care, who first came for treatment in July last for what was clinically an inoperable spheroidal-celled carcinoma in the neighbourhood of the left breast. The tumour was the size of a large orange and fluctuated; in connexion with it was a fungating patch about 2 in. square, which discharged freely. The left arm was œdematous and tender, the supraclavicular group of glands was enlarged and there was a fair amount of pain. She has now had thirty pastille doses measured under 1-mm. filter on the tumour itself and twenty-one similar doses over the neighbouring lymphatic areas. The result has been complete relief of pain, the discharge soon ceased, the tumour itself is smaller, the fungating mass has practically disappeared, and the arm is normal in size. The supraclavicular group

of glands are, however, still enlarged. Whether the ultimate result has been postponed or not there can be no doubt of the value of the treatment.

What is the ideal method in the treatment of these cases? Should we gain by the employment of powerful apparatus as used by Krönig's school for the treatment of uterine fibroids, and by that means give massive doses of the very hard type of radiation filtered off by 3 mm. of aluminium? On the other hand, is the specific sensibility of carcinoma cells such that they are more affected by rays less hard and in such doses as we have employed? Judging from the effect of the X-rays and radium one would expect the best results from the hardest type of radiation possible.

(B) *Prophylaxis after Operation for Carcinoma Mammæ*.—Eleven cases. There is no doubt that radiation of the operation area adds to the comfort of the patient, the wound cleans more quickly and there is considerable relief from stiffness which is sometimes felt directly after the sitting. One must wait for statistics to show its value in the prevention of recurrences. It seems, however, rational to insist that the dose should be large and that as much as possible of the lymphatic system draining the affected area should be covered. We radiate the operation scar, the axilla, the supraclavicular and scapular lymphatic areas with one pastille dose measured under $\frac{1}{2}$ or 1 mm. aluminium. The ideal method would be to repeat this several times. We try to manage about three sittings.

(C) *Recurrence after Operation*.—Small nodules in the skin yield very readily to filtered doses. In rapidly growing metastases the only value of radiation lies in its relief of the pain. Three cases.

Exophthalmic Goitre.—Five cases improved, still under treatment; two improved, but ceased attending; two not improved. There was usually some improvement either in physical signs or in the well-being of the patient. There was one patient in particular who while steadily losing weight under ordinary medical treatment has gained nearly a stone since X-ray therapy was started. The pulse-rate, however, is so far unaffected. The usual filtered doses were given once or twice weekly with occasional intervals.

Electro-therapeutical Treatment at St. Thomas's Hospital during the Year 1913.

By W. R. BRISTOW, F.R.C.S.

DURING the year 1913 the number of treatments given in the Electro-therapeutical Department was 5,230. About 500 new cases were seen during the year. The forms of treatment used were chiefly (1) muscular stimulation, (2) ionization, (3) diathermy; whilst a very few cases were treated by (a) high frequency, (b) faradic baths.

The electrical reaction—muscle testing—was performed in thirty-four cases. The old method of coil testing via a metronome was used, as the Department does not yet possess the requisite apparatus for testing by means of condenser discharges. This method, which seems infinitely preferable to the older one, we hope to adopt during the present year. A large part of the treatment of this Department consists in the stimulation of muscles by means of the interrupted current.

The type of case treated is usually one of the following: (1) Acute or chronic sprain; (2) wasted muscles following operation or injury; (3) wasted muscles following general diseases—e.g., post-diphtheritic paralysis; (4) wasted muscles in connexion with chronic joint disease, usually rheumatoid or osteo-arthritis; (5) a few cases of ununited fracture.

The treatment consists in stimulating the injured or wasted muscle to contract, the amount of the contraction being graduated by the intensity of the stimulus. By using an induction coil in which both primary and secondary are made of thick wire, and with a large and heavy make and break the current given is practically painless. It is necessary for the patient's muscles to be absolutely relaxed during the treatment, and the painful stimulus of an ordinary faradic coil renders this impossible.

N.B.—The apparatus is not yet very satisfactory. The vibrator is too light and not sufficiently regular.

The muscles are treated in this way daily, if possible for about twenty minutes at a sitting. The average duration of a course of treatment for, say, a badly wasted quadriceps group would be about three weeks. It is preferable not to interrupt by a metronome in the circuit, but rather to get the gradual rise and fall by pushing in and out the iron core of the primary. The contraction thus produced simulates exactly the normal physiological contraction of the muscle, whilst if the metronome be used

the contractions are a series of jerks. No form of mechanical resistance in the secondary gives perfect working, because the intensity of stimulus necessary varies with each muscle, and each part of a group of muscles. The left hand holds the active electrode in firm contact with the patient's muscle, and so realizes the amount of contraction. The right hand working the core of the primary can vary the stimulus from moment to moment as may be found necessary by the amount of contraction felt by the left.

By means of using a number of electrodes (up to six) of fair size, bandaged on various muscles, setting the coil in motion and using a metronome in the secondary, we have more or less imitated Bergonié's method. This we have used with success in some few cases of general muscular weakness. One case in particular, a man with post-diphtheritic paralysis of both legs and both arms, improved rapidly, and the Medical Registrar told me that he would in the ordinary way have remained in the ward, having massage for about three months. He was walking in a month. Another interesting case was a man, aged 50, with dilated stomach, chronic indigestion of twenty years' standing, and no sign of pyloric obstruction. His abdominal muscles were treated and he improved very rapidly; lost all symptoms and was discharged. He remained well for eight months and then the symptoms all returned. He was readmitted and an abdominal exploration revealed a large gastric ulcer. The strange coincidence was that he had lost his symptoms after six treatments and remained well for so long.

We have most excellent results from this treatment, and wasted muscles which have failed to respond to massage have regained their tone and recovered their function. It is of course useless to treat muscles which give no response to faradic stimulus in this way. In these cases we use interrupted galvanic, but in recovering muscles, as soon as they begin to contract to the faradic, we revert to this method. The virtue of this form of treatment lies not in the current itself but in the contraction and its attendant chemical changes, which bring about the desired result.

Ionization.—Ionization with sodium salicylate 2 per cent. solution has given encouraging results. The sittings last from forty minutes to an hour, and are usually given three times during the first week and after that bi-weekly. The best results are shown in cases of neuritis—e.g., brachial neuritis—and in acute and subacute rheumatoid arthritis. This treatment also we usually adopt for sciatica in the acute stages. Some of the cases do well and others continue attending for a very long time. Some are quite intractable to treatment, and one such was

handed over for X-ray treatment as it seemed to be an exactly suitable case in which to try the method described by Dr. Delherm and Eugene Py, in the *Archives of the Röntgen Ray*. The treatment was unfortunately wholly unsuccessful. These results are based on fifty-five cases treated during the year. The chlorine ion has also been tried in a good many cases. The excellent results published by Leduc and others in the cure of that type of stiff joints caused by sepsis, by means of sodium chloride ionization, we are not able to imitate here. Five such cases, the result of old cellulitis, were treated for periods of from three to nine months, and were not improved in the least. Large currents up to 100 ma. and sittings of an hour were tried. This method failed equally in cases of stiff knee-joints. Ionization with silver nitrate was given in two cases of ulcerative colitis. In one, a man, aged 22, the result was excellent. There was a history of the passage of blood and mucus for twelve months, and the ulcers were seen by the sigmoidoscope. The patient having been prepared as for a hæmorrhoid operation, and a morphia suppository given an hour before, 15 oz. of 1 per cent. solution of silver nitrate were injected. The current used varied from 10 to 15 ma., and this he stood for thirty minutes. There was an immediate improvement, and he passed no blood or mucus for five days. He was treated five times in all, and was discharged cured. The second case was a woman, aged 38. We had great difficulty in this case in getting her to retain the fluid for any length of time, and the first few attempts were failures. Ultimately she took about 15 oz. and held it for thirty minutes. She was improved, but the treatment caused pain, and on two occasions some collapse and faintness at the time. The difficulty in these cases seems to be to get the patient to retain the proper amount of fluid so that the silver ionization may reach the actual site of the ulcers if these extend well up into the colon. The colon and rectum are very intolerant of fluid in their inflamed state, and a very efficient preparation by enemata was necessary in our cases.

Diathermy.—The electrodes used are plain metal, which are bandaged firmly in position. They are made of sheet tin. These seem preferable to the type usually employed, and although the metal and the patient's skin are in direct apposition, burns have so far been avoided, and the patients tolerate larger currents than when porous covered electrodes soaked in salt solution are used. Each sitting lasts for from twenty to forty minutes, and currents up to 2.5 amperes are given. The most satisfactory results are obtained in treating lumbago. True sciatica does not seem to improve very much by diathermy, and

in sciatica cases salicylic ionization gives better results. We also use diathermy treatment for the pain in osteo-arthritis.

High Frequency.—The main use of this is for functional pain. Here the results are of course psychical. One case so treated, in a male, aged 43, who was in the wards for a long time with abdominal pain following an operation, lost all pain with two applications of high-frequency current with a brush discharge, the sparks of which were large and probably painful. We have not treated any cases of high blood-pressure during the year by high frequency.

Faradic Baths.—These have been used in some few cases. A case of Raynaud's disease of six months' standing with symptoms of numbness of left hand and swelling, improved from the commencement of the treatment and was completely cured in a month. In the general way, we use a direct application of the interrupted current to the particular part rather than a faradic bath.

The Treatment of Diseases of the Skin with X-rays and Ultra-violet Light.

By DUDLEY CORBETT, M.D.

THE following cases of skin disease are among those which have been under treatment during 1913:—

Rodent Ulcer.—Twenty-eight cases treated: Six cured, twelve improved and still under treatment, seven improved but ceased attending, three no improvement. Here better results have been obtained from unfiltered rays, one pastille dose being given once a month. Sometimes we have employed $1\frac{1}{5}$ dose as a start with advantage. It would seem that the rodent ulcer cells are more sensitive to rays that are stopped by aluminium filters, and in this we have an analogy in the behaviour of skin diseases in general to X-ray therapy—better results are obtained with unscreened rays. Those cases where the bone is already exposed may improve for a time, but sooner or later prove quite refractory.

Tinea.—Two hundred and thirty cases treated: One hundred and seventy-two cured; fifty-eight are still waiting to be passed. There were two groups of cases which had to be treated a second time; the first was due to the lack of a proper standard for tint B when the Department was first opened, and the second from the use of pastilles insufficiently bleached. We have used for some months a new form of radiometer which I have worked out. It is described in the current volume of the *Proceedings*, and was shown before the

Dermatological Section in November.¹ In this instrument a tint B is standardized which allows a 20 per cent. margin of error on either side—*i.e.*, $\frac{4}{5}$ B nearly always epilates, and $1\frac{1}{5}$ B is nearly the limit of safety. The tints are composed of coloured glass standardized spectroscopically, and can be supplied in any fractional or multiple dose up to 2 B. There is a separate series for daylight and for standard artificial light. The standard light is an 8-c.p. carbon filament lamp obscured in the usual way. All the cases of tinea have been examined by myself before being allowed to return to school. There is one class of case which seems to be getting commoner now that I am specially looking for it. In these cases all the infected hairs break off level with the skin, and though epilation is apparently complete yet the microscope will reveal spores in the roots. It is not easy to remove these roots, and one is liable to miss them unless a careful examination is made. The best plan is to scrape the skin with a scalpel, when the roots will be detached with the superficial layers of the epidermis. There have been no cases of permanent alopecia. We have not yet started any method of half-time distance. I should like to hear from members their experience of any such method. It must, of course, diminish the margin for error.

Other Skin Diseases.—We have closely followed the doses and time intervals as employed by Schultz. I am quite sure that the long intervals that he recommends between each course of three $\frac{1}{3}$ B doses or two $\frac{1}{2}$ B doses are essential. In this manner the skin does not lose its sensitiveness and become refractory to X-rays, and a reaction can be avoided with certainty in those cases where this is undesirable. The hardness of rays employed varies between 5 and 7 Bauer.

Eczema.—Seventy-six cases treated: fifty-two cured, twenty-one improved and still under treatment; three improved but ceased attending. These cases embrace all the forms of eczema, including the acute, chronic, and seborrhoeic varieties. A large proportion of these were cases which had resisted all other forms of treatment for many months. One-third doses were given with the appropriate intervals, except in the case of the hyperkeratotic forms, where half doses were given. Relapse does occur, but it is not common over the treated area.

Psoriasis.—Fourteen cases treated: six cured; five improved, and still under treatment; three improved, but ceased attending. These cases were all selected as being resistant to the ordinary forms of treatment. Greater care is needed in the treatment of this condition than

¹ *Proceedings* (Dermat. Sect.), p. 30.

is the case with eczema, as a reaction causes an extension of the process. The intervals should be strictly maintained therefore. Relapse is not infrequent, but not more so than after other forms of treatment. One-third doses were employed except in the case of chronic, thickened patches, when half doses seem to be most suitable.

Lupus.—We use the Kromayer lamp now entirely in the place of Finsen light. The exposures are seldom longer than ten minutes, and usually shorter; a large area can be conveniently covered—a saving of time and trouble, and the results are apparently in every way as good. In very sensitive cases we have found the use of the methylene blue filters advisable. In nearly all cases the X-rays have been employed as an adjunct, and occasionally alone. Their value in clearing away redundant tissue and healing ulcerations is well known, and I can give you no better example than this case of ulcerative lupus, which has been cured with X-rays alone. Cases during the year, seventy-seven: Cured, seven; improved and still under treatment, sixty-four; improved, but ceased attending, six. Hypertrophic cases receive $\frac{4}{5}$ B, others half or $\frac{1}{3}$ B, depending upon the thickness of tissue involved.

Alopecia Areata.—The ultra-violet rays from a mercury vapour lamp are employed extensively in some of the German clinics for this condition. Although we have not given exposures sufficiently long to produce the severe reactions described by Nagelschmidt, yet we have had satisfactory results, especially in children. We now employ an ordinary Cooper-Hewitt quartz lamp air-cooled and suitably boxed in, and give exposures of about ten minutes at a distance of about 4 to 6 in. Cases: Eight cured; fifteen improved and still under treatment; four improved, but ceased attending; two not improved.

Miscellaneous.—Among this group may be mentioned eight cases of lichen planus, four of which were cured, the others improved; two of seasonal prurigo and one of Hebra's prurigo, which have derived great benefit, losing all their pruritic symptoms and a large proportion of the original eruption. The case of Hebra's prurigo was that of a small boy; the pruritus was intense, and he was in a miserable condition, the eruption extending over the greater part of the trunk and limbs. The improvement under $\frac{1}{3}$ doses was remarkable. There were three cases of the type of tuberculide known as Bazin's disease, two of which are cured and one is improving under treatment.

In conclusion, I should be glad to know if anyone has experimented with the over-soft rays of 1.0 to 1.5 Wehnelt, as described by Schultz and used by him with apparent success in the treatment of *nævi flammei*. It is almost impossible to obtain these rays in any amount with the apparatus and tubes at our disposal.

Electro-Therapeutical Section.¹

February 20, 1914.

MR. C. THURSTAN HOLLAND, President of the Section, in the Chair.

Discussion on the Use of Electrical Methods and the Value of Radiography in the Diagnosis and Treatment of Neurological Conditions.

Opened by H. LEWIS JONES, M.D.

THE time has come for a review of the methods of using electricity, both for testing and for treatment in cases of paralysis. Progress has been made in several directions, and this combined meeting of the Sections of Neurology and Electro-Therapeutics may, with great advantage, discuss these new developments, in order to standardize our work, if possible, and to pronounce authoritatively upon the best modes of procedure in such cases.

The points I submit to the meeting are the following: First, as to treatment. In the treatment of paralysed muscles the treatment must be a rhythmically varying one, with a rate of about fifteen periods of action and of rest per minute. Next, the current should be used for longer periods and of greater strengths than has hitherto been usual. And lastly, there is an advantage in using condenser discharges instead of induction-coil currents, because they are more agreeable to the patient. On the first of these points, that of the use of rhythmically varying currents, it is still necessary to insist, because hitherto their value has been accepted, but hardly adopted. At St. Bartholomew's

¹ Joint meeting with the Neurological Section.

Hospital they have been in regular use for some years, but, so far as I can learn, they have not yet come into very general use in the electrical departments of other hospitals or in private practice. And yet the matter is of the greatest importance. The simple tetanization of muscles tends rather to fatigue and injure than to develop them, as has been proved by experiments on animals and by observations on human beings. It is enough to mention that the circulation through a muscle in a state of tetanus is greatly interfered with; to see that stimulation which affords periodic intervals for the renewal of the blood supply must be better than stimulation which does not permit this. The need for rhythmic variation of currents is now generally acknowledged, and it is high time for it to be more widely acted upon. Formerly it was difficult to use rhythmic interruptions, because the apparatus was not made—except to order—by dealers in electro-medical apparatus; but now there are several forms of good rhythmic interrupter on the market, and I have brought two to show here in action to-night. I should, perhaps, digress for a moment to remind the meeting that there are two varieties of rhythmic interrupter. There is one which just turns the current on, and off again after an interval. And there is the other kind, in which it not only does that, but turns it on weak, strengthens it up to a maximum, and then lets it weaken again before it is turned off; the current, in fact, is made to wax and wane, and not to come on suddenly. That is the more important type, and the interrupters I speak of to-night are in that class. The waxing and waning effect is obtained by means of a resistance in the circuit, which is made to vary continuously. One of the simplest variable resistances is a water resistance; that is to say, a vessel of water in which a conductor moves up and down. As it dips down to reach the bottom, and again as it rises up, the intervening layers of water vary in thickness, and the resistance of this part of the circuit varies continually, and so a current which rises and falls is produced.

With regard to my second point, that of the use of larger currents, we can bring into play what we have learned from the principles of ionic medication. That has taught us how to make large currents tolerable to the patient, by a change in the form of the electrodes. The old type of electrode, consisting of a metal disk thinly covered with wash-leather, gave the maximum of discomfort and the minimum of efficiency. For treatment they are to be discarded. In their place thickly folded cloths are used, wet with salt solution, and these, with a metal electrode over them, are bandaged upon the limb. The treat-

ment in an arm-bath with rhythmic currents was also a very good way of obtaining the best muscular effects without pain; but it is rather limited in its utility to injuries situated in the nerves of the forearm or hand, and is less well adapted to other parts of the body. The method I have indicated can be applied to any part or any group of muscles. With regard to the length of the applications, Bergonié, of Bordeaux, in a very good paper on the treatment of infantile paralysis, speaks of treatments lasting half an hour or an hour, repeated twice a day, without evidence of the slightest fatigue or exhaustion on the part of the patient. If we want to cultivate muscles, particularly those suffering as a result of peripheral nerve injuries, we must give longer and stronger applications; and now we know how to do that without hurting the patients, it is high time we adopted the plan.

My third point, the use of condenser discharges to take the place of the induction coil, is newer, and has not been tried except by a few observers. The advantages of it are two in number. It is less painful than induction currents, and more accurate for measurement. For both of these reasons I can speak with confidence of it. For more than six months I have used condenser discharges for muscle stimulation, to the complete exclusion of the use of induction coils, and I am satisfied that the condenser method is the better. To secure all the advantages possible from the condenser method we must use small capacities and high voltages. Small capacities give short waves, and it is the short waves which stimulate painlessly: 120 volts and a few tenths of a microfarad form a suitable combination.

In the use of condensers for treatment one needs a succession of discharges, but for testing a single impulse is sufficient. For treatment the discharges must be rapid enough to cause tetanic contractions. This is done by a mechanically operated commutator, which is so connected as to perform a cycle, first charging the condenser from the source and then discharging it through the patient. Mr. Schall has constructed a commutator for me with brushes, and Mr. Miller has made one with a mercury jet, and both work well and are here to-night for inspection.

There is another point which must be considered in discussing the treatment of peripheral paralyses, and that is the treatment of the lesion in the nerve. We have all been too readily satisfied with stimulation of the muscles as the mode of treating such cases. With the additional resources we possess to-day in ionic medication the treatment of the nerve acquires fresh importance. For instance, in facial paralysis we

should use ionic methods applied to the trunk of the nerve, and not rest content with some stimulation of the facial muscles. I have seen good results follow this procedure in several cases of facial paralysis, and I think the time has come when we should begin to utilize a similar ionic method applied to the lesion of the nerve-trunk in various other cases of nerve-trunk injury.

The Electrical Testing of Muscle and Nerve, with Special Reference to the New Method in which Condensers are used.

By E. P. CUMBERBATCH, M.B.

THE subject which I wish to present for discussion is the Electrical Testing of Muscles. First, I wish to point out the defects of the method in general use; secondly, to describe briefly the new method of testing by means of condenser discharges, point out its advantages, and mention some of the results which have been obtained by its use.

The method of testing which is generally employed has been in use during the past forty-six years. It has many defects.

In the first place, it causes much pain. Young children and nervous adults will not keep still when they feel the sting of the galvanic current, so that it is almost impossible to see what sort of contraction the current is producing.

In the second place, it is sometimes very difficult to say, without taking graphic records, whether the contraction produced by the galvanic current is quick or slow. It may be neither quick nor slow, and, often, there is no normal muscle on the opposite side to serve as the standard for comparison. Further, some muscles, even when normal, contract more slowly than others. The abductor muscles of the great and little toes give slow contraction when stimulated by the galvanic current, so that the reaction looks like a partial R.D. (reaction of degeneration). Again, temperature influences the speed of contraction. The muscles of a part such as the hand or foot contract more slowly if the part be cold than if it be warm. I recently tested the intrinsic muscles of a cold blue hand. Using the galvanic current the muscles contracted extremely slowly, but when the temperature of the hand

was raised the contraction became very brisk. The subnormal temperature of paralysed limbs must exercise an important influence on the response of the muscles, and may lead to error in the diagnosis of their electrical reactions.

In the third place, little or no attention is paid to the *measurement* of the electrical stimulus used, yet the matter is of much importance. The *duration* of the stimulus, particularly, should be known, and its importance lies in the fact that a perfectly normal muscle can respond to an exceedingly brief stimulus; that when it passes out of the normal condition it requires longer stimuli, and when it passes further and further into a more and more advanced degree of degeneration, longer and longer stimuli are required to make it contract, stimuli that are now several hundred times longer than the shortest required for normal muscle.

Hitherto we have used as our stimuli the interrupted current from the coil and the continuous current from the battery. The interrupted current, so called, is really a succession of discharges following one another, at a rate depending on the rate of vibration of the interrupter fitted to the coil. The discharge at "make" of the primary current differs from the discharge at "break," both in duration, intensity and direction of flow, so that when the induction coil is used for physiological and clinical purposes we are employing a stimulus of extreme complexity. "Induction coil discharges are impulses of irregular form and variable duration, and are by no means the instantaneous discharges which they have been too commonly assumed to be." Dr. Lewis Jones, from whose work, "Medical Electricity" this quotation has been taken,¹ has taken graphic records of the waves of discharge of many induction coils, and he has shown that in many medical coils they last about $\frac{1}{400}$ sec. Normal muscle will respond to an infinitely shorter stimulus, and it will have passed some way along the downward path of degeneration if it requires an impulse as long as this before it will contract. The waves of discharge vary profoundly in their shape and duration, according to the construction of the coil, length of wire in the primary and in the secondary circuits, rate of vibration of hammer, presence or absence of iron in the coil, &c. Unnecessary complications are thus introduced into the study of the effect of electrical stimuli upon muscle and nerve when the induction coil is used. Further, there is no satisfactory way of measuring the strength of the discharge, so that it is

¹ Sixth Edition, p. 278.

difficult to be certain whether the response of muscle is weaker or stronger than normal.

How long is the impulse given by the galvanic current? This, again, is not measured, and depends upon the time the key is held down and the current allowed to flow. It is always longer than necessary, and, therefore, unnecessary pain is caused.

What is wanted is some device which will give impulses of *known duration*, varying between the shortest to which normal muscle will respond and the longest that is required when it has reached an advanced degree of degeneration, with as many intermediate values as are found desirable. Condensers of different capacities furnish impulses of different but known duration. They have been used in the past chiefly for physiological purposes, but the apparatus designed by Dr. Lewis Jones is the most complete of its kind, and is the first one to be used in this country. To him is due the credit for introducing a new method which is destined to throw new light on the subject, where there is, at present, much doubt and obscurity.

In principle the new method is simple. It is necessary to know that when a condenser is charged the duration of the wave of discharge depends, first, on the capacity of the condenser (which is known) and, secondly, upon the resistance of the circuit through which the discharge takes place. The resistance of the body has been proved to be constant for discharges of very brief duration, and may be taken as 1,000 ohms under the conditions in which the test is made. The resistance of the rest of the circuit may be neglected.

In Dr. Lewis Jones's apparatus twelve condensers are used. They are packed away in a small box. The smallest has a capacity of 0.01 microfarad, the largest a capacity of 2.00 microfarads. There are ten of intermediate capacities. By means of a metronome any one can be automatically charged to a known voltage and then discharged through the body. The smallest condenser gives a discharge through the body lasting $\frac{1}{24000}$ sec., while the discharge of the largest lasts $\frac{1}{200}$ sec. The most convenient voltage to which to charge the condensers is 100. To test a muscle, the smallest condenser is used first, and if no response occurs, larger and larger condensers are used, giving discharges of longer and longer duration, till the muscle contracts. There is no need to decide whether the contraction is quick or slow. In the past we have had to classify the reactions of muscles under three heads—normal, partial R.D., complete R.D. At the present day we can use condenser discharges giving a wide range of stimuli of known duration, and are

able to express the condition of the muscle by the measure of the duration of the shortest effective impulse, or the capacity of the condenser which gave it.

During the past year I have been using condensers for the purpose of testing muscles and, whenever possible, I have repeated the test using the older method. It was soon apparent that the new method was much less painful than the old; in fact, the smaller capacity condensers produce no pain at all. The larger condensers produce the sensation of a sharp tug, which is, however, much less painful than the sting of the galvanic current. Young children will submit to the shocks from smaller condensers without moving, and it is best, when testing the reactions of any patient, to use the smaller condensers first and leave the larger condensers, if they have to be used, to the end.

The first investigation was made to determine the condenser figures that correspond to the three types of reaction, normal, partial R.D., and complete R.D. Healthy muscles will respond to discharges from the smallest, or nearly the smallest condenser. Muscles of which the motor point lies more superficially (like the face muscles and many of the limb muscles) will give a perceptible contraction with the smallest condenser in the box, one of capacity of 0.01 microfarad. If the motor point lies more deeply, the next size larger, 0.02 microfarad, is required. Some muscles which are weakened or paralysed are found to require larger condensers, 0.02, 0.05, 0.07, although, by the older method, they may still show the normal reaction. The condenser method thus gives a subdivision of the normal type of reaction and indicates slight departure from the normal which the older method cannot show. Muscles with slight degrees of deviation from the normal are demonstrated by the condenser method in cases of paralysis or weakness secondary to joint disease.

Muscles which show, beyond doubt, a partial R.D. require condensers of larger capacity; some require 0.10, others 0.25, others 0.50; so that we may subdivide muscles showing this reaction into three groups. It was found, however, that some muscles which gave undoubtedly a partial R.D. could be made to respond to *smaller* condensers than those just mentioned, such as 0.07, 0.05, and occasionally 0.02. This has been found to be the case with some of the muscles quite recently affected by acute anterior poliomyelitis. Its possible significance will be mentioned shortly. It appears, then, that muscles showing the partial R.D. will have to be subdivided into many groups.

Muscles which show the complete R.D. require a condenser as large as 0.5, and very many will require one of 1.00, 2.00, or 3.00 microfarads. It was soon found that many muscles giving, by the older method, a complete R.D. would not respond to condensers even as large as 3.00. Larger condensers cannot be used as their discharges produce violent muscular tugs which are too disagreeable to bear. A condenser of 2.00 microfarads' capacity gives a discharge lasting $\frac{1}{200}$ sec. In order to get a still longer discharge for muscles in a further stage of degeneration, a high resistance may be placed in circuit with the patient. This considerably lengthens the duration of the discharge. 5,000 ohms is, I find, the most suitable resistance, and with this in circuit the duration of discharge of the three largest condensers in the box (1.00, 2.00, and 3.00 microfarads) is increased from $\frac{1}{400}$, $\frac{1}{200}$, and $\frac{1}{130}$ of a second respectively, to $\frac{1}{70}$, $\frac{1}{30}$, and $\frac{1}{20}$ of a second respectively. It is necessary, however, to charge the condensers to 200 volts when this high resistance has been inserted. This does not alter the duration of the discharge, and it can be quickly and easily done in Dr. Lewis Jones's apparatus. I have recently tested some muscles which would not respond to condensers as large as 5.00 microfarads charged to 200 volts, and with resistances as great as 10,000 ohms in the circuit. These muscles gave some response to the galvanic current, however, so it appears that there is a stage of degeneration which is beyond the reach of the condenser test.

We may thus recognize three or four subdivisions of the normal type of reaction, four or five of the partial R.D. type, and eight or more of the complete R.D. type.

Now comes the most important question, What new clinical knowledge is likely to result from this more complete subdivision of those muscles that show alterations in their reactions? This is, of course, a subject in which prolonged investigation of many cases is required, and much work will have to be done. Some cases may, however, be briefly mentioned, in which the results appear significant.

Case I.—A boy gradually lost the use of his legs. Neuritis was diagnosed and no cause was discovered for it. The leg muscles showed the complete R.D. when tested by coil and battery. The smallest of the condensers required for muscles with complete R.D., viz.—0.50, 1.00 and 2.00—caused the leg muscles to contract. Evidently, the degeneration had not progressed far. The patient soon regained full use of his legs and the power to walk.

Case II.—An infant lost power in its right leg, as the result of acute anterior poliomyelitis. It could not walk or move its leg. The anterior tibial

group of muscles and the peronei showed a complete R.D., the calf muscles a partial R.D. A week later the paralysis was still present and the muscles were tested by condensers. The anterior tibial group required 0'05 (partial R.D. by old method), the peronei required 2'00 (complete R.D. by old method), the calf muscles required 0'01 (partial R.D. by old method). Evidently, the degeneration was of a slight degree, suggesting a favourable prognosis. A month later the child had regained voluntary power in the limb and could walk. The condenser figures were now 0'05 for the anterior tibial group, 0'07 for the peronei, 0'05 for the calf muscles.

These two cases seem to indicate that if a muscle can respond to a discharge from a *smaller* condenser (i.e., to a discharge of comparatively brief duration) the degeneration has proceeded to a slight degree only, and that the nerve supplying it has been only slightly damaged, and that the outlook is favourable.

Case III.—By using the condenser method it is possible to get more information concerning the *progress* of a case. A patient who was in hospital for operation on the nose complained of weakness of one leg, and it was noticed that he had developed "hallux-drop." All the leg muscles showed R.D. By using the new method of testing it was found that condensers of different capacities were required for different muscles, but no one required one larger than 3'00. Four months later the patient thought that his leg had recovered, although some of the movements were less strong than those of the other leg. Another test was made by the new method, and it was found that the muscles formerly requiring 3'00 now would respond to 0'10, those formerly requiring 0'50 now responded to 0'05.

Case IV.—A patient with paralysis of some of the muscles of both legs resulting from acute anterior poliomyelitis was tested, and it was found that the anterior tibial group (among others) showed complete R.D. About three months later, when the condenser apparatus had been installed, it was found that the same group required a condenser of 5'00 microfarads charged to 200 volts, with a resistance of 5,000 ohms in the circuit. Six months later no condenser could produce any contraction. On these three occasions there was no voluntary power, and the older method of testing showed the same reaction each time—complete R.D. These muscles were shown by the condensers to be progressing on the downward path.

Case V.—A patient fractured his leg. It was discovered later that he had lost the use of some of his leg muscles, and it was thought that the external popliteal nerve had been compressed by callus. The muscles showed complete R.D. No condensers, however, could produce any contraction. It was found that the nerve was not in callus. It had evidently been severely contused, and it was throttled by scar tissue. The muscles could not be made to

contract by stimulating the main sciatic nerve in the thigh, so there was evidently a "functional" division of the popliteal nerve. Perhaps the failure of a muscle to respond to any condenser means that nerve impulses cannot pass the injured part. I have not yet had the opportunity to apply the condenser test to muscles of which the nerve has been anatomically divided, without reunion.

I think that condenser discharges may prove to be of value in determining the condition of nerve-trunks when diseased, from the point of view of their excitability. I have found that when a muscle can be made to contract on stimulating its nerve, different capacity condensers are required in different cases, whereas normal nerve-trunks, if not lying deeply, can be excited by condensers of the smallest capacity.

CONCLUSIONS.

(1) Induction coils are unsuitable for the stimulation of muscle and nerve. Most medical coils give discharges which are not brief enough to reveal the slighter degrees of degeneration, whilst the complex form of the waves of discharge, varying in different coils, introduces unnecessary complications. Further, the intensity of the discharge is not easily measured.

(2) It is often difficult to tell whether the response of a muscle to the galvanic current is quick or slow. The measurement of the duration of flow of this current is not made, though if this is done several degrees of degeneration will be made out.

(3) By the use of condensers electrical stimuli are standardized and measured both in intensity and duration.

(4) Condenser discharges cause much less pain, and enable the recognition of many different degrees of degeneration which may prove to be of value in diagnosis and prognosis.

DISCUSSION.

Dr. HAMPSON said he was glad to bear testimony to the excellence of the results obtained by using the surging current advocated by Dr. Lewis Jones, who, he hoped, would believe that the method was not so much neglected as he appeared to think. A comparatively short time after Dr. Lewis Jones introduced his method of rhythmical stimulation he, encouraged by the example, brought it into use at the Queen's Hospital for Children, and with

the most gratifying results; there was a great improvement in the condition of children the subjects of infantile paralysis compared with that when previous methods were applied. Moreover, the testimony of parents was more pronounced and frequent. He had also found the results very gratifying in private practice, not only in infantile paralysis, but in connexion with many internal muscles, such as those of the intestines and stomach. The pulsatile stimulation was much better than the form previously in use.

Dr. REGINALD MORTON agreed with Dr. Lewis Jones as to the value of slowly varying currents. The matter was not very new; in fact, ten years ago it took a fresh form, when someone brought out the idea of using a three-phase current. He believed it was Dr. Herschell who devised the ordinary motor with necessary device to take off a three-phase current, and made it run very slowly by a friction brush applied to the wheel. Later on he (the speaker) was himself experimenting on the matter, and he had a machine made which would run very slowly. It was found very useful in the treatment of intestinal conditions. Later investigations convinced him that the three-phase current was an unnecessary refinement of the single-phase, sinusoidal current. The aim was to get it to vary sufficiently slowly and yet obtain a strong enough current. That was not secured owing to mechanical and electrical difficulties. Gradually those instruments had been displaced by the rhythmic interrupter, which was one of the best and most useful devices available for electrical treatment for nerves or muscles, internally or externally. Towards the close of the session last year he showed an instrument by means of which one could apply the constant, or the interrupted, current through a rhythmic interrupter, and he said on theoretical grounds, after some practical experience, that he thought the same principle could with advantage be applied to ionization. It had always seemed to him that if one was using very large current densities for the purpose of ionization, or anything else, one was certainly producing a tetanic condition of tissues; the circulation would be to some extent arrested and there would be some spasm in the arterioles. If one wanted to ionize, he thought it would be better if one could allow the current to be regulated by a rhythmic interrupter. He had used this for many months and was certain that the results were more pleasing and more comforting to the patient, and there was no risk of burning. He had left off using rigid electrodes, and thought that ionization was more efficient.

Dr. HERNAMAN-JOHNSON said he was much interested in the remark of Dr. Cumberbatch about the excitability of a muscle being lowered by cold. For some time the practice which he had followed in the case of paralysed limbs—e.g., in infantile paralysis, when the skin is often blue and cold—was to warm these limbs up by means of radiant heat before proceeding to apply electrical stimulation. He was sure, from his experience, that the results obtained after such a method were better than without it. Dr. Cumberbatch's observations seemed to furnish a scientific reason for the fact.

Dr. LEWIS JONES, in reply, expressed his regret for having appeared to have forgotten Dr. Hampson's excellent form of rhythmic interrupter. He remembered it very well. He could confirm what Dr. Hampson said about the value of rhythmic currents in the treatment of obstinate constipation, because in the summer he had been asked to advise as to the best way of treating one of these very troublesome cases. He advised its treatment with a rhythmic apparatus and a rectal electrode. The case derived benefit from the commencement, and had done very well. He desired to put on record the name of a worker who seemed to have been completely forgotten, that of the first user of rhythmically varying currents—namely, Dr. Frommhold. He treated patients by "swelling currents," obtained by moving the secondary coil of the apparatus by hand during the time of the treatment.

Diseases of the Pituitary Gland and their Effect on the Shape of the Sella Turcica.

By E. G. FEARNSIDES, M.B.

ANATOMICALLY the pituitary body or hypophysis cerebri consists of two great portions—a glandular anterior lobe and a nervous posterior lobe. Embryologically these two lobes have different origins, the anterior being derived from the epiblast of Rathke's pouch, and the posterior from a downgrowth of neuroblast from the region of the third ventricle. Physiologically the anterior and posterior lobes appear to serve different functions, the anterior being related to the general growth of the body, and especially of the skeleton, whilst the posterior lobe and its glandular envelope, the pars intermedia, seem to promote the contractility and increase the tone of the plain muscle generally, as well as of the heart, and to excite the activity of certain glands—viz., the kidney and mammary gland (Schäfer). Extracts obtained from the posterior lobe when injected into animals produce changes in the blood-pressure, changes in the secretion of the urine and of the mammary gland, and cause contractions of all involuntary muscle, whilst extracts made from the anterior lobe are relatively inactive. By the methods of extirpation of portions of the gland in animals it has been shown that removal of the anterior lobe produces adiposity, accompanied by secondary hypoplasia of the organs of generation in the adult, or by a persistence of sexual infantilism in case the primary hypophyseal deficiency antedates adolescence, and occasionally by polyuria, altera-

tions in the skin and its appendages (such as œdemas and hypotrichosis), and by a tendency to the development of a subnormal temperature and psychic disturbances (Crowe, Cushing and Homans); whilst the posterior lobe plays a significant rôle in the metabolism of carbohydrates.

The pituitary body lies in the most protected portion of the skull, encased in the bony sella turcica, and in the anterior angle of the optic chiasma. It is separated from the general cranial cavity by a firm fibrous connective tissue layer, the diaphragma sellæ, a part of the dura mater, which is perforated in its middle to allow of the passage of the infundibular stalk. The most common and most important disorders of the pituitary body are caused by tumour growths, arising either in the gland itself or from one of the neighbouring "rests" of the cranio-pharyngeal duct, which frequently persists into adult life as an evidence of the double nature of the body itself. Clinically, the disorders which arise in consequence of changes in the pituitary body are extremely complex. For disease processes may originate in either lobe without the involvement of the other, or one lobe may be the seat of an adenomatous change and physiologically over-active, and by pressure upon the other lobe may impair its function and cause an under-activity of this part, or the body may be involved secondarily owing to changes elsewhere inside the cranial cavity, or in some one or other of the inter-related organs of internal secretion — e.g., the thyroid or the ovaries.

In practice, patients showing features similar to those obtained experimentally in animals are not uncommon. In the course of the last seven months, at the London Hospital, I have seen some dozen examples of such cases. In these examples the clinical features appear to have been an expression *either* of a deficiency *or* an excess, *or* an alteration in the activities of one or other or both lobes of the body.

Comparing the disorders due to the pituitary body with those met with in the case of the thyroid gland, the custom has grown up of speaking of *hyper(super)pituitarism* when the clinical features are believed to be an expression of excessive activity on the part of the gland, of *hypo(sub)pituitarism* when they are assumed to be due to a deficient secretion of the gland, and of *dyspituitarism* when due to more or less complex alterations affecting the secretion of the two lobes together. Acromegaly is believed to be the clinical expression of hyperpituitarism. Dystrophia adiposo-genitalis (Fröhlich syndrome) and some forms of infantilism and of glycosuria are supposed on good grounds to be expressions of hypopituitarism. In the majority of patients showing

hyper-thyroidism the thyroid gland shows considerable enlargement. The pituitary body, as we have already seen, lies encased in the bony sella turcica. If an enlargement of the gland takes place, either the diaphragma sellæ must be freed from its attachments to the clinoid processes, or the bony walls of the fossa must be eroded. In either case the outline of the base of the sella turcica will be altered by disease of the contained pituitary body, and a skiagram will give us definite evidence of these changes. In acromegaly, in our experience, there is always some definite evidence of an increase in size of the pituitary fossa. In hypo(sub)thyroidism (myxœdema), on the other hand, a small thyroid is the rule. By analogy, therefore, we should expect that in hypo(sub)pituitarism little or no change in the configuration of the pituitary fossa would appear in skiagrams of this region, and this I believe to be a common finding. Like certain cases of Graves's disease, which later develop features of myxœdema, certain cases of acromegaly later acquire features similar to those found in hypo(sub)-pituitarism. In skiagrams of the skull of these patients we should expect to find changes in the sella turcica, and Cushing has shown that this does actually happen.

Cushing has divided the enlargements of the sella turcica occurring with primary growths arising from the pituitary body itself into three types: (1) Those associated with thickening of the clinoid processes and dorsum sellæ; (2) those showing thinning from pressure absorption of these parts; and (3) those showing more or less destruction of all the outlines of this region; and states that tumours arising from the pituitary stalk in the inter-peduncular region, and situated above the sella—the so-called superimposed tumours—give rise to changes in the sella turcica only after they have reached a considerable size (Goetsch). In the skeleton the measurements of the normal pituitary fossa, as given by Keith, average antero-posteriorly (interclinoid distance) 10 to 12 mm., 14 to 15 mm. transversely, and 8 mm. in depth. In profile skiagrams, measurements exceeding 15 mm. antero-posteriorly and 10 mm. in depth may be looked upon as indicating an enlargement (Cushing). With an undistended sella the floor of the fossa in the skiagram should show a single clear basal outline.

Clinically, the twelve cases which I wish to bring to your notice to-night can be divided into: Examples of acromegaly, three; dystrophia adiposo-genitalis, three; infantilism and optic atrophy, one; primary optic atrophy and glycosuria, one; optic atrophy without any signs of disturbance in general metabolism, one; hydrocephalus, spastic paraplegia and

ataxia of the legs, with sub-pituitarism, one; the "pudding-face" type of dyspituitarism, two.

Clinically, the three examples showing acromegaly differed widely. In Case I, a man, aged 46, the condition was completely stationary; the skeletal overgrowth had appeared between the ages of 24 and 30, and for fifteen years before the patient came under observation for the radical cure of a large inguinal hernia had been completely stationary. Cases II and III, on the other hand, came under observation complaining of the recent increase in size of their extremities and head. In Case II, a woman, aged 40, the overgrowth commenced when she was aged 37, whilst in Case III, a man, aged 46, changes in the size of the bones began to appear at the age of 44.

The radiographical findings in Cases I and II are similar in each, the clinoid processes are displaced upwards and the floor of the fossa is depressed with the formation of anterior and posterior bulges, and the interclinoid distance in each measures 15 mm. In Case III, on the other hand, the floor of the fossa in the skiagram appears natural, but there is some displacement upwards of the clinoid processes without much alteration in the interclinoid distance, which measures 10 mm.

In Case I no changes in the fundus oculi or in the visual fields were present, and there were no signs of local nervous derangements. In Case II, on the other hand, although the fundus oculi appeared natural, the visual fields showed some contraction downwards and outwards, and in Case III there was much contraction of both visual fields, the left being small and the right extremely small. In Case II no signs of local nervous involvement were present, but in Case III the patient complained of attacks of giddiness and of headache, although no evidence of gross nervous derangements was obtained.

The three examples of dystrophia adiposo-genitalis clinically resemble one another more closely. In Case IV, a boy, aged 20, symptoms appeared at the age of 17. In this case there is the history of a fall, followed by a period of shock with loss of consciousness lasting some twenty-four hours, and the development of right-sided internal ear (nerve) deafness at the age of 10. Three years after the onset of symptoms this patient, in addition to dystrophia adiposo-genitalis, suffered from occasional attacks of diplopia, a permanent squint due to a paresis of the right external rectus, and right internal ear deafness; the visual fields were slightly contracted, but no changes in the fundus oculi were present; the knee-jerks on each side were exaggerated, and the right and left plantar responses were of the extensor type. The skiagram of the sellar region, however, showed no definable abnormalities.

In Case V, a boy, aged 15, symptoms appeared at the age of 12½. Two and a half years later he showed softening of the edges of the optic disks and much limitation of the upper and lower visual fields; on the left side ptosis was present; the pupils contracted sluggishly to light, but diplopia had never occurred. He was typically spastic, with scissoring of the gait, due to a severe degree of adductor spasm. The knee-jerks were exaggerated, ankle clonus could be obtained on each side, and the plantar responses were definitely extensor. The skiagram shows a general downward enlargement of the floor of the pituitary fossa and an apparent shortening of the posterior clinoid processes.

Case VI, a girl, aged 11, came under observation in August, 1913. At that time she was fat, and her mental condition closely resembled that observed in Cases IV and V; her visual fields were normal and the fundus oculi on each side appeared natural. Under observation, she has developed bilateral pyramidal interference, with ankle clonus on the left side, and bilateral extensor plantar responses; the left leg has become extremely spastic, and at the same time the optic disks have become pale and atrophic and their edges softened. In the skiagrams of this patient, taken in August, 1913, and in January, 1914, the sella turcica appears ill defined and shallow.

Case VII is an example of the Lorain type of dystrophy associated with disease of the pituitary body. At the age of 16 this patient developed a left-sided temporal hemianopsia, followed, a few months later, by a right-sided temporal hemianopsia, and within the space of two and half years he became totally blind. Shortly after this he developed slight exophthalmos on each side, left-sided ptosis, strabismus, and signs of pressure upon the left crus cerebri. The skiagram of this patient shows an extensive, irregular enlargement of the pituitary fossa; the enlargement has taken place chiefly in a forward direction, and there is a shadow of a long posterior clinoid process.

In Case VIII, a married woman, aged 54, primary optic atrophy developed at the age of 46. In 1908 this patient was under observation in hospital; the only sign of derangement discovered at this time was bilateral white atrophy, and the urine contained no sugar. In 1913, when she was readmitted complaining of attacks of colic, glucose was found to be present in the urine. As in-patient she suffered from typical attacks of hepatic colic, and a diagnosis of gall-stones was made. The diagnosis explained the attacks of colic, and suggested a cause for the glycosuria, but not for the blindness. A skiagram of the skull was taken; this shows a general disturbance in all the outlines of the

pituitary fossa, no clinoid processes, but a less dense shadow, evidently due to a pituitary cyst, above the region of the sella turcica. At operation a single gall-stone was found blocking the cystic duct; the pancreas appeared normal. The suggestion is that a cystic pituitary tumour encroached on the optic chiasma, causing blindness, and on the posterior lobe of the pituitary gland, giving rise to glycosuria. On the other hand, the glycosuria might have been due to pancreatic disease.

In Case IX the diagnosis of pituitary disease depends solely upon the X-ray findings. In October, 1910, this patient developed bitemporal hemianopsia, and in March, 1912, this hemianopsia was the only discoverable manifestation of disease, but the skiagram shows a slight general enlargement with some increase of the antero-posterior diameter of the pituitary fossa.

Cushing has shown that many patients with cerebral tumours, although they vomit freely, do not waste, and that at autopsies on cases which in life showed signs of increased intracranial pressure the pituitary body often shows signs of compression. From these observations he was led to collect evidence on the frequency of the appearance of manifestations of sub-pituitarism in clinical examples of increased intracranial pressure, and states that this is not infrequent. Case X is an example of such an occurrence. The patient, a boy, aged 5, has a large head and other manifestations of hydrocephalus; in addition he shows spasticity and ataxia of the legs; the knee-jerks are exaggerated, ankle clonus is readily elicited on each side, the right and left plantar responses are of the extensor type, and he suffers from incontinence of urine. The skiagram of the skull of this patient shows an extremely shallow, small pituitary fossa.

Cases XI and XII are examples of another variety of dyspituitarism—the so-called “pudding-face” type. Case XI, a young woman, aged 21, was perfectly normal until the age of 18½, then amenorrhœa set in, her hair fell out, and her voice changed; shortly after this her face grew fat and “pudding-like,” and her hair grew thick and curly. Since this time she has not menstruated, and no further changes in her appearance have occurred. The blood-pressure in May, 1913, was 180 mm., but under the administration of thyroid extract fell to 120 mm. No abnormal nervous signs have ever been discovered. The skiagram of the skull shows a rather deep sella turcica (12 mm.), with well-defined lower margins and no change in the antero-posterior diameter. In many ways this case resembles a case of myxœdema, but treatment with thyroid extract has not removed any of the disabilities.

Case XII, a girl, aged 15, is said to have been normal until the age of 7, then in the course of a few months an almost complete external ophthalmoplegia, associated with bilateral ptosis, developed. At the age of 15 she has never menstruated, and is an undeveloped girl showing no secondary sexual characters, a large "pudding" face, and extremely defective external eye movements, but no other nervous signs. Her thyroid shows considerable enlargement, with the development of a goitre. The skiagram of the skull shows an extremely small and very shallow sella turcica, measuring antero-posteriorly 5 mm. and 5 mm. in depth. The suggested explanation of the clinical findings is that some change has occurred in the activities of the pituitary gland; the development of an enlargement of the thyroid gland is in accordance with this hypothesis.

In addition to the changes in general metabolism, disease processes arising in the pituitary body owing to the anatomical relations of the gland to the optic tracts, to the third cranial nerves, and to the crura cerebri, early give rise to localizing nervous signs. The appearance of these, together with the changes known to occur when the activities of the pituitary body are deranged, or with radiographic changes in the conformation of the sella turcica, render diagnoses of pituitary disorder more certain than in most other intracranial conditions. In doubtful cases a change in the size or shape of the sella turcica as seen in the X-ray plate is at present the most certain evidence of pituitary disorder.

Acromegaly, Stationary.

Case I.—J. D., male, aged 45, carman (Dr. Thompson's case). Onset of condition between 24 and 30 years of age. Eight healthy children ranging from 22 to 8 years of age. Stationary for many years. Sella turcica: The clinoid processes are displaced upwards; the interclinoid distance measures 15 mm.; the floor of the pituitary fossa shows an anterior and a posterior bulge. Visual disturbances: Disks and fundi healthy; visual fields normal. Skeletal signs: Classical signs of acromegaly with enormous hands and feet, and great overgrowth of inferior maxillæ; "Punchinello" chest. Cutaneous and subcutaneous: Distribution of fat normal; cyanosis of hands and feet. Sexual glands natural. Tolerance of carbohydrates: 200 gm. of glucose given by mouth were not followed by the excretion of sugar in the urine. Thyroid of average size. Voice natural. Oculo-motor nerves unaffected; other cranial nerves unaffected. Reflexes, &c.: Reflexes, motion and sensation unaffected. Sphincters controlled. Urine natural. Wassermann reaction negative. Temperature normal. Pulse 60 to 70. Admitted to hospital for radical cure of a large right inguinal hernia.

Acromegaly, Progressive.

Case II.—A. M., female, aged 40; married (Dr. Thompson's case). Onset of condition when aged 37. Right breast removed for chronic mastitis when aged 33. Sella turcica: The clinoid processes are displaced upwards; the interclinoid distance measures 15 mm.; the floor of the pituitary fossa shows an anterior and a posterior bulge. Visual disturbances: Disks and fundi healthy; visual fields show some contraction down and out on each side; central vision for form and colour good. Skeletal signs: Classical signs of acromegaly; large hands and feet; great overgrowth of lower jaw; no kypho-scoliosis. Cutaneous and subcutaneous: Dry skin and harsh hair suggesting myxœdema. Catamenia regular. Tolerance of carbohydrates not tested. Thyroid small, not palpable. Voice natural. Blood-pressure 125 mm. Hg. Drowsy. Psychic disturbances: Slow in speech and in action. Oculo-motor nerves unaffected; other cranial nerves unaffected. Reflexes, motion and sensation unaffected. Sphincters controlled. Urine natural. Wassermann reaction negative. Temperature normal. Pulse 72.

Case III.—I. L., male, aged 46, bootlaster (Dr. Hutchison's case). Onset of condition when aged 44. Sella turcica: The clinoid processes are slightly displaced upwards; the floor of the pituitary fossa appears natural; the interclinoid distance measures 10 mm. Visual disturbances: Old iridectomy, right, when aged 44; fundi and disks healthy; left visual field small, right extremely small; central vision good. Skeletal signs: Classical signs of acromegaly; feet and hands large; large lower jaw: head enlarging—larger hat—circumference 22 $\frac{7}{8}$ in. Cutaneous and subcutaneous: Distribution of fat normal; skin dry and harsh. Sexual glands natural. Tolerance of carbohydrates: 300 gm. of glucose administered by mouth were not followed by the excretion of sugar in the urine. Thyroid of average size. Voice natural; speaks English badly. Torpidity and drowsiness: Attacks of giddiness followed by somnolence and accompanied by intense general headache and at times by vomiting. Psychic disturbances: Slow in speech and in action. Oculo-motor nerves unaffected; other cranial nerves unaffected. Reflexes, motion and sensation unaffected. Sphincters controlled. Urine natural. Wassermann reaction negative. Temperature normal. Pulse 70 to 80.

Dystrophia Adiposo-genitalis.

Case IV.—F. B., male, aged 20, carman (Dr. Wall's case). History of cranial injury when aged 10, onset of symptoms when aged 17. Sella turcica: Shape normal; the interclinoid distance measures 10 mm. and the depth is 10 mm. Visual disturbances: Disks and fundi healthy; (?) some limitation of visual fields (not very definite). Skeletal signs: Epiphyses of fingers and toes not joined; swelling of left fourth toe; swelling, chiefly periarticular, of left second and third fingers and of right third and fourth. Cutaneous and

subcutaneous: Skin soft and feminine; general excess of fat of "typus femininus"; no excess of pigmentation; no pubic or axillary hair. Testes and external genitalia small and infantile. Tolerance of carbohydrates: No sugar detected in the urine after the ingestion of 200 gm. of glucose. Thyroid small. Voice treble and infantile. Blood-pressure: 60 mm. Hg., rising to 120 mm. on treatment with pituitary extract. Torpidity and drowsiness: Somnolence noteworthy. Psychic disturbances: Unconscious of changes in himself; dull, intelligent, good-tempered; no initiative. Oculo-motor nerves: Occasional diplopia; pupils reacted normally. Other cranial nerves: Smell unaffected; weakness of right sixth; permanent squint; right nerve deafness. Reflexes, &c.: Knee-jerks exaggerated; no ankle clonus; bilateral extensor plantar responses. Sphincters: Attacks of incontinence of urine and fæces usually by night. Urine natural. Wassermann reaction negative. Weight, 7 st. 10 lb. Temperature subnormal (96° to 97° F. in morning, 98° F. in evening). Pulse 100.

Case V.—J. W., male, aged 15 (Dr. Kidd's case). Onset of symptoms when aged 12½. Enlargement of sella turcica chiefly downwards, but there are no bulges on the lower outline; the posterior clinoid processes appear shortened and displaced upwards; the interclinoid distance measures 15 mm. Visual disturbances: Disks pale, with softening of the edges; no lamina cribrosa seen; much limitation of upper and lower visual fields. Skeletal signs: Delayed union of all epiphyses. Cutaneous and subcutaneous: Skin soft and feminine; general excess of fat of "typus femininus"; no excess of pigmentation; no pubic or axillary hair. Testes and external genitalia small and infantile. Tolerance of carbohydrates: No sugar detected in the urine after 200 gm. of glucose had been taken by mouth. Thyroid small. Voice treble and infantile. Extremely drowsy. Psychic disturbances: Dull, good-tempered; simple, intelligent; no initiative. Oculo-motor nerves: Ptosis left; no diplopia; pupils irregular, reacted sluggishly to light. Other cranial nerves, &c.: Smell unaffected; facial movements irregular, no facial palsy; no deafness. Reflexes, &c.: Spastic gait; adductor spasm; knee-jerks exaggerated; bilateral ankle clonus; bilateral extensor plantar responses. Sphincters controlled. Urine natural. Wassermann reaction negative. Weight, 7 st. 12 lb.; height, 4 ft. 10 in. Temperature subnormal. Pulse 90.

Case VI.—S. D., female, aged 11, school-girl (Dr. Lewis Smith's case). Onset of symptoms when aged 10½. Sella turcica shallow and ill defined: the interclinoid distance measures 5 mm. (when aged 11) and the depth of the fossa is 4 mm. Visual disturbances: August, 1913, no changes in disks; January, 1914, optic disks pale and atrophic, edges softened, lamina cribrosa persists. Cutaneous and subcutaneous: Some excess of fat; skin extremely soft and downy; no growth of axillary or pubic hair. Tolerance of carbohydrates: No sugar detected in urine after the administration of 200 gm. of glucose. Thyroid small. Voice squeaky. Blood-pressure, 88 mm. Hg. Torpidity and drowsiness not noteworthy. Psychic disturbances: Dull, stupid, slow at learning; intelligent. Oculo-motor nerves;

Pupils normal; slight ptosis left; no diplopia. Other cranial nerves: Smell unaffected; sixth, seventh, and eighth unaffected. Reflexes, &c.: Spastic gait and adductor spasm developed between August, 1913, and January, 1914; knee-jerks exaggerated, left more than right; ankle clonus left; extensor plantar responses right and left. Sphincters controlled. Urine natural. Wassermann reaction negative. Weight, 6 st. 4 lb. Temperature subnormal. Pulse 80.

Lorain Type, with Optic Atrophy.

Case VII.—W. C., male, aged 19 (Dr. Head's and Mr. Roxburgh's case). Sella turcica: Extensive irregular enlargement of the sella turcica; the enlargement has taken place chiefly in a forward direction; there is a very definite shadow of a long posterior clinoid process; the interclinoid distance measures 32 mm. Visual disturbances: Bilateral primary optic atrophy; onset with left temporal hemianopsia followed by right temporal hemianopsia; then progressive loss of nasal vision to complete blindness two and a half years after onset of symptoms. Skeletal signs: Delayed union of epiphyses. Cutaneous and subcutaneous: Sparsely covered boy; no growth of pubic or axillary hair. Testes and external genitalia infantile. Tolerance of carbohydrates: No sugar appeared in the urine after 300 gm. of glucose had been taken by mouth. Thyroid of average size. Voice treble and infantile. Blood-pressure, 100 mm. Hg. Torpidity and drowsiness very noticeable; some general headache. Psychic disturbances: Mental changes developed two years after onset of left temporal hemianopsia. Oculo-motor nerves: Some exophthalmos right and left; slight ptosis left; external squint left; pupils, no reaction to light (blind). Other cranial nerves: Weakness upper and lower right half of face; paresis of right halves of palate and tongue. Reflexes, &c.: Right hemiplegic weakness; knee-jerks exaggerated; no ankle clonus; right plantar response extensor. Sphincters controlled. Urine natural. Wassermann reaction negative. Temperature subnormal. Pulse 80.

Pituitary Cyst; Primary Optic Atrophy; Glycosuria with Cholelithiasis.

Case VIII.—M. B., female, aged 54, married, six living children (Dr. Head's case). Menopause when aged 48. Onset of blindness when aged 46. Sella turcica: There is much general disturbance of the outlines of the pituitary fossa; no shadow of the clinoid processes can be distinguished, and an estimate of the interclinoid distance cannot be made; above the sellar region is a less dense shadow evidently due to a pituitary cyst. Visual disturbances: Complete bilateral primary optic atrophy with total inability to appreciate light and darkness. Cutaneous and subcutaneous: Well covered; the fat has a normal distribution. Menopause when aged 48. Tolerance of carbohydrates: 3 per cent. glucose, with no aceto-acetic acid in urine; the sugar disappeared from the urine on dieting; after operation no change in sugar tolerance. Thyroid

of average size. Voice natural. Oculo-motor nerves: Pupils do not react to light (blind). Other cranial nerves unaffected. Reflexes, motion and sensation unaffected. Sphincters controlled. Urine: No albumin; 3 per cent. glucose; *Bacillus coli* in cultures. Wassermann reaction: Negative in serum and in cerebrospinal fluid; 1 cell per cubic millimetre in cerebrospinal fluid. Weight, 11 st. 9 lb. Temperature normal. Pulse 60 to 70. Admitted to hospital with hepatic colic due to a gall-stone; operation; recovery; after removal of stone from cystic duct no alteration in sugar tolerance occurred.

Optic Atrophy; Bitemporal Hemianopsia; Sellar Changes.

Case IX.—D. B., female, aged 32, nurse (Mr. Roxburgh's case). Onset of hemianopsia, October, 1910; under observation March, 1912. Sella turcica: There is a slight uniform enlargement with commencing increase in the distance between the clinoid processes (15 mm.). Visual disturbances: Bitemporal hemianopsia; primary optic atrophy, right and left. Cutaneous and subcutaneous: No gross abnormalities in fat discovered; at onset of visual changes got "fatter," now normal again; hair falling out, skin dry. Catamenia regular. Tolerance of carbohydrates not tested. Thyroid not palpable. Voice natural. Torpidity and somnolence: Intense headaches at the onset, with somnolence; these had passed away before the patient came under observation. Oculo-motor nerves: Light shone into right eye yielded no contraction of pupils; into left eye caused both pupils to contract. Other cranial nerves unaffected. Reflexes, motion and sensation unaffected. Sphincters controlled. Urine natural. Wassermann reaction negative. Weight, 9 st. 6 lb. Temperature normal. Pulse 80 to 90.

Hydrocephalus; Spasticity and Ataxia of Legs; Dyspituitarism.

Case X.—I. D., male, aged 5 (Dr. Kidd's case). Sella turcica: The pituitary fossa is shallow; the interclinoid distance measures 10 mm., and the depth is 7 mm. Visual disturbances: Disks pale, fundus generally pigmented; vision good. Skeletal signs: Large head with frontal bossing, otherwise *nil*. Cutaneous and subcutaneous: Fat boy with olive complexion. Genital organs very undeveloped. Tolerance of carbohydrates not tested. Thyroid not palpable. Oculo-motor nerves unaffected; other cranial nerves unaffected. Reflexes, &c.: Spastic and ataxic legs (? cerebellar ? posterior column ataxia); knee-jerks exaggerated; bilateral ankle clonus; plantar responses extensor, right and left; sensation apparently unaffected. Sphincters: Dribbling incontinence of urine. Urine natural. Wassermann reaction negative in serum and in cerebrospinal fluid; pleocytosis in cerebrospinal fluid. Temperature normal. Pulse 80 to 90.

Sub-pituitarism, Pudding-face Type.

Case XI.—H. W., female, aged 21, machinist (Dr. Thompson's case). Onset of symptoms when aged 18½. Sella turcica well defined; the interclinoid distance measures 10 mm., the depth is 12 mm. Visual disturbances: Disks and fundi healthy; slight general limitation of the fields of vision in all directions. Cutaneous and subcutaneous: Well covered, shoulder contours rounded; fat, red, outstanding cheeks; hair of scalp dry and curly, of pubes and axillæ harsh and scanty; staphylococcal abscesses leading to ulcers on shoulders, abdomen and back. Amenorrhœa since she was aged 18½. Rectal examination negative. Mammæ small, nipples pigmented. Tolerance of carbohydrates: No sugar detected in urine after the administration of 180 gm. of sugar by mouth. Thyroid not palpable. Voice: Harsh, squeaky, "can no longer sing." Blood-pressure: 180 mm. Hg., falling to 120 mm. on administration of thyroid extract. Torpidity and drowsiness not noteworthy. No gross psychic disturbances; had become introspective because her face attracted attention. Oculo-motor nerves unaffected; other cranial nerves unaffected. Reflexes, &c., natural. Sphincters unaffected. Urine natural. Wassermann reaction negative. Weight, 8 st. 4 lb.; height, 5 ft. 3 in. Temperature subnormal. Pulse 70 to 80.

Sub-pituitarism, Pudding-face Type; Ophthalmoplegia.

Case XII.—B. W., female, aged 15 (Dr. Head's case). Normal till aged 7, when aged 8 eye movements were lost; since then no change in vision or in eye movements. One brother aged 17 and one sister aged 8. (? Congenital abnormality.) Sella turcica: Pituitary fossa small and shallow, the interclinoid distance measures 5 mm. and the depth of the sella is 5 mm. Visual disturbances: Disks and fundi healthy, no œdema and no atrophy; visual fields natural. Subcutaneous fat to excess; fat, rounded, red cheeks; skin coarse and dry. Sexual glands: Jewess, aged 15, but has never menstruated. Tolerance of carbohydrates not tested. Definite goitrous enlargement of thyroid. Voice: Speaks slowly, voice squeaky and childish. Torpidity and drowsiness: Not noticeable. Psychic disturbances: Standard VII, when aged 14; inattentive until objects are seen, then attention is good. Oculo-motor nerves: Grave but not total ophthalmoplegia externa, right and left; no power of convergence, but no diplopia; in good lights pupils at times unequal but both reacted well to light; considerable ptosis right and left. Other cranial nerves: Smell unaffected; no deafness; facial movements natural. Reflexes, &c.: Knee-jerks natural; plantars flexor. Sphincters unaffected. Urine natural. Wassermann reaction negative. Weight, 5 st. 2 lb. Temperature subnormal. Pulse 96 to 100.

The Radiographic Appearances of the Sella Turcica, in Diseases of the Pituitary Gland.

By S. GILBERT SCOTT.

THE radiographical studies of the sella turcica, to which attention was first called by Oppenheim in 1899, have proved a most useful adjunct to the investigation of hypophyseal disease. It must be borne in mind, however, that sellar deformations are merely of accessory value to the symptomatic manifestations, for we must realize that definite symptoms of pituitary disease may be present, with but little, if any, alteration in the shadow cast by the bony encasement of the gland.

The skeletal measurements for the normal sella turcica average 10 to 12 mm. antero-posteriorly, 14 to 16 mm. transversely, and 8 mm. in depth. In the skiagram there is a very slight increase of the actual size, this being due to the distance of the sella turcica from the plate. It must be remembered that the clinoid processes each possess two "horns" and a broad base. Thus it is important that the view taken is absolutely lateral, so that these "horns" coincide, otherwise a wrong impression will be got of the shape and size of the fossa. This correct lateral view is the most difficult part of the technique. The technique will be discussed later.

It is as well to bear in mind the chief anatomical relations of the sella. *In front and on each side* of the anterior clinoid process are the optic foramina through which the optic nerve and the ophthalmic artery enter the orbit. These, therefore, are likely to be pressed upon if the pituitary enlargement or tumour extends forwards and laterally.

The *base* forms the roof of the sphenoidal cells; these are sometimes invaded. The growth may completely erode the base, and in extreme cases of enlargement, as is sometimes seen in acromegalics, several perforations may be found in the sellar base extending into the sphenoidal sinus. The *roof* is formed by the diaphragma sellæ and pedicle of the pituitary gland which are liable to pressure if extension is upwards. Posteriorly there is the anterior border of the pons.

PITUITARY TUMOURS.

The changes seen in *pituitary tumours* are: (1) Destruction of the *clinoid processes*, if rapid growth; (2) expansion, if slow growth;

(3) irregular erosion of *base*. The *early* appearances, therefore, are increase of the space between the clinoid processes and apparent enlargement of sella turcica on this account. Later, of course, there is definite irregular enlargement of the whole fossa. Expansion is evidenced by the *lengthening* of the processes *upwards*. This condition is nearly always present in a more or less degree in the expansion seen in acromegalics. When this is present it means that the growth of the tumour is slow, this gives the bone time to expand, probably by laying down new bone, as is seen in slow-growing endosteal bone tumours. If the tumour is cystic in nature a light area can sometimes be noted in the region of the sella turcica. This area, however, is usually lighter than the surrounding brain; if caused by a cyst the outline is much more defined. If solid a dense shadow will show the outline in favourable cases. Alteration in the outline of the sella turcica is present in all cases where a tumour originates in the gland itself. A tumour *above* the sella may eventually produce flattening of the clinoid processes and pressure on the pedicle or gland itself.

ACROMEGALY.

In acromegalics the appearances are somewhat different in character. As mentioned previously, it is possible to have such a case, showing all typical clinical signs and appearances, in which there is practically no alteration in the shape or size of the sella turcica. It is difficult to account for this, unless it is that it is possible to have a great increase in the secretion of the gland, without any increase of its size. The first variation from the normal is usually seen at the *base* of the fossa, not of the clinoid processes as with pituitary tumours. Here extension seems first to take place, due presumably to enlargement of the anterior and posterior lobes, downwards, as the increase or "bulging" is most marked at the position of these lobes. The clinoid processes in these cases may remain unaltered, even though the extension at the base is extensive. Thus one finds the space between the processes only slightly increased in the early stages. Later, however, this space is increased, and the clinoids appear displaced upwards. This is most noticeable in the posterior process, which in the majority of cases is seen as a thin line, marking the posterior limit of the gland. In one case this was as long as 22 mm. To my mind this is an indication of slow growth, as was previously mentioned in the case of a slow-growing pituitary tumour.

There is a great similarity in the appearance of the sella turcica

seen in the skiagrams of these cases of acromegaly; when one has come across three or four, there is no difficulty in recognizing the condition, without the clinical signs or symptoms to help one.

TECHNIQUE.

Here the chief difficulty, as mentioned previously, is to obtain an absolutely lateral view of the fossa. To obtain this correctly, it is essential (1) that the tube is accurately centred through the sella; (2) that the base of the patient's skull is horizontal; (3) plate is vertical—this, of course, with patient upright. Of course there must be no movement on the patient's part, and the exposure correct.

I use a special form of apparatus for these examinations, and the same as for the localization of foreign bodies in the eye. The patient sits in a chair, with the side of the face against a cylinder, the diameter of which is 6 in.; the length is such that the distance from the anode to the patient is 12 in. The end of this cylinder is covered with parchment, this gives better support. Fixation of the head is obtained by means of: (1) a head-rest; (2) a chin-rest, and (3) a mouth-piece which is firmly gripped by the teeth. The plate is held in position by a carrier from above. The tube is accurately centred through the cylinder, and the patient's head is carefully adjusted, so that the central ray passes through a known spot on both sides of the head. The centring of these "known spots" is carried out by placing lead shot one on each side of the head, 1 in. in front and $\frac{1}{2}$ in. above the external auditory meatus, and by a screen examination, getting these to coincide accurately. These should be removed before the exposure, otherwise they will obstruct the sella turcica. I am making a piece of apparatus for this purpose, which consists of a pair of spectacles on the arms of which are adjustable sliding lead pellets.

I do not find stereoscopic views of much assistance in diagnosis.

I have treated this subject very briefly, only mentioning the chief alterations seen in the sella turcica, in cases of pituitary tumour and acromegalics. There are many points that require further investigation, and for this reason have been omitted.

Lantern slides and tracings comparing the normal with the abnormal sella turcica were shown.

DISCUSSION.

Dr. FINZI said he felt much interested in the communications of Dr. Fearnside and Mr. Scott, because he had directed his attention to the same class of work. Within a few months last year he had a number of cases of acromegaly and of hypopituitarism, or at any rate infantilism of different kinds, and in the cases of infantilism he was unable to discover any change, except possibly that the pituitary fossa was small. He emphasized the remark about the importance of getting the rays through the fossa exactly lateral. The method he employed for this purpose was as follows: He had the patient lying down with his head on one side, with the tube beneath the couch, and the screen over the patient's head. He put a sixpenny-piece into each ear; by moving the tube about the images of the coins could be superimposed, one could be made to appear as a halo round the other, and a central ray was then coming through the external auditory meatus. To get it opposite the pituitary fossa he moved the tube forwards 1 in. and upwards 1 in., and that corresponded to the $\frac{1}{2}$ in. above the base of the skull which Mr. Scott mentioned. The base of the skull was not exactly transverse to the couch, so by moving the tube box upwards an inch he moved the rays an inch above the base of the skull. That brought the central ray exactly opposite the pituitary fossa, and the results obtained were of the same type as Mr. Scott's.

Dr. J. METCALFE said he had made several examinations of the type described, and was much indebted to Dr. Finzi for his valuable suggestion with regard to the method which he had given to him some time ago. Dr. Parkes Weber had sent him a number of cases for X-ray examination. Some of them showed slight alterations in the sella. Many of the cases although clinically showing evidences of acromegaly and other disorders usually associated with the pituitary body did not show distinct evidences of changes in the sella. With regard to Dr. Fearnside's remark that he could say there was some change in the pituitary body from clinical evidence alone, without any X-ray changes, he would like to know if he had seen any of these cases in the post-mortem room. If not, it was not certain as he affirmed that the disease was *actually* in the pituitary body. He was sorry not to have heard anything about treatment. He would like to know if Mr. Scott treated any of these cases by X-ray methods. Cushing said that X-ray treatment of hyperplasias and other conditions in the pituitary bodies was of distinct use, sometimes improving the fields of vision as well as the general condition of the patient.

Dr. E. S. WORRALL said that several of the skiagrams which Dr. Scott showed reminded him of a case which he saw eight years ago; he meant those showing change in the posterior clinoid process, elongating it. In this case the floor of the sella turcica was normal, and there was no pituitary growth, but the posterior clinoid process was much elongated and enlarged. We must

remember that this process forms part of a tunnel through which the internal carotid artery passes. The diagnosis he gave was aneurysm of the internal carotid, and it proved to be so. The method of fixation of the patient's head and seeing that the normal ray passed accurately through the sella turcica to the plate was very essential. And the quality of the ray must not be too penetrating. With a sufficiently soft ray much detail of the softer parts might be made out. He remembered a case sent to him with a diagnosis of upper cervical mischief. The skiagram he took included the base of the skull. On looking at it he could see no changes in the upper cervical vertebræ, but an obvious change in the sella turcica. His diagnosis was a pituitary tumour which was encapsuled, cystic, and showed calcification in patches in the posterior and lower part. The case was successfully operated on. The tumour removed proved to be exactly as he had described.

Dr. F. PARKES WEBER said Dr. Finzi did not mention one advantage of the method he used—namely, that when the sixpenny-pieces, or leaden plugs of some kind, had been employed one could see by their position in the skiagrams whether the skiagrams in question had been taken in a fairly correct position, whereas in Mr. Scott's method it was necessary to remove the shot before the skiagrams could be taken. The skiagrams of the base of the skull, showing a plug of some kind in each ear, must always tell their own true story as to the position of the head whilst the skiagram was being made.

Mr. S. G. SCOTT, in reply, said he had not attempted treatment of the conditions under discussion. With regard to Dr. Parkes Weber's remarks, there was no difficulty in estimating the exact position of the sella turcica by the method described.

Electro-Therapeutical Section.

March 20, 1914.

Dr. G. HARRISON ORTON, Vice-President of the Section, in the Chair.

Discussion on the Radiographic Appearances of Bone Tumours, Benign and Malignant.

Opened by W. J. S. BYTHELL, M.D.

IT was on account of a paper published a few weeks ago in the *British Medical Journal* by Sir Alfred Pearce Gould entitled "Radium and Cancer,"¹ in which he described a case of periosteal sarcoma which he claimed to have cured by means of radium, that I suggested a discussion on the subject. I and several others wrote to the *British Medical Journal* criticizing the diagnosis of this case from every point of view. In my letter, I confined myself to the X-ray diagnosis, and pointed out the reasons why, in my opinion, the skiagram published by Pearce Gould clearly showed the case to be one of myositis ossificans, and not periosteal sarcoma. (I will show you a reproduction of this skiagram upon the screen later on.)

It is, therefore, in connexion with the X-ray diagnosis of sarcoma that I wish to show a few slides this evening, in order to emphasize what I consider to be the distinguishing features of the disease. In the first place, I think there is usually little difficulty in recognizing a central sarcoma, such as you will see in the first two slides.

Slide 1.—Central sarcoma of ulna; rapid history, death from metastases three weeks after skiagram taken; man, aged about 39. Appearance quite unmistakeable (fig. 1).

Slide 2.—Central sarcoma of tibia; child, aged about 6. In this practically the whole of the tibia has disappeared, the fibula remaining untouched; there was also a big sarcoma of the parietal. Appearance again distinctive.

¹ *Brit. Med. Journ.*, 1914, i, pp. 1-6.

Slide 3.—The third slide shows a somewhat similar type of growth, with extensive destruction of the head of the femur; this was a case of secondary carcinoma, but the diagnosis was obvious from the history of the case.

As a rule, such cases as these are easily recognized by means of radiography. There is greater difficulty when we have to deal with skiagrams showing periosteal shadows, and the three conditions between which we have to distinguish are periostitis of various kinds, myositis ossificans, and periosteal sarcoma.

Slide 4.—The next slide shows a typical skiagram of septic osteomyelitis, with a dense shadow on the inner side of the tibia, obviously due to periostitis. It is accompanied by rarefaction of the bone caused by the septic process, and there is no doubt as to the diagnosis in a case like this.

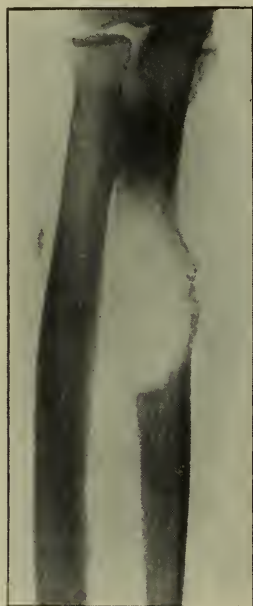


FIG. 1.

Fig. 1.—Central sarcoma of ulna.

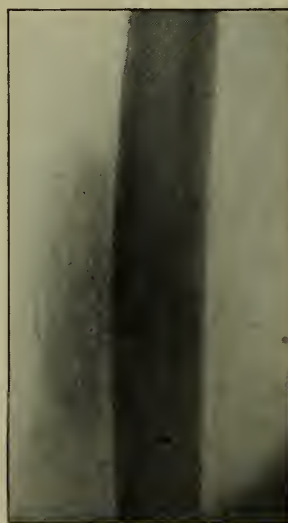


FIG. 2.

Fig. 2.—Myositis ossificans over anterior surface of femur.

There is much more room for doubt when we have to distinguish between periosteal sarcoma and myositis ossificans, and it is with this point that I wish particularly to deal. I will show you three skiagrams of myositis ossificans, and then I will show you reproductions of Pearce Gould's skiagrams.

Slide 5.—This slide is, unquestionably, one of myositis ossificans. I have had the patient under observation for many months, and there has never been any suggestion of sarcoma (fig. 2).

Slides 6 and 7.—The next two slides also show very similar cases of myositis ossificans.

In all these three cases you can see the essential features of this condition — namely, (*a*) a laminated arrangement of flaky shadows parallel to the surface of the bone; and (*b*) a distinct line of demarcation between the adventitious shadows and the bone itself, showing very clearly that the bone is not involved.

Slides 8 and 9.—This slide and the next are reproduced from the two illustrations in Pearce Gould's article on "Radium and Cancer" to which I have alluded, and are the skiagrams of the case which he diagnosed as periosteal sarcoma and claimed to have cured by means of radium. I think you will all agree that they are practically identical with those I have shown of myositis ossificans. In fact, I think no further comment is needed.

In the later stages of myositis ossificans the shadows tend to become more defined, and usually closely adherent to the bone, as in

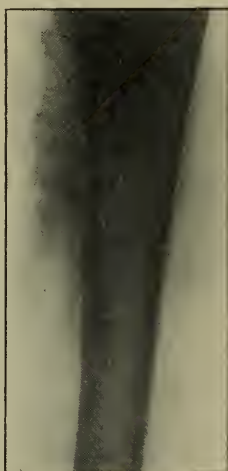


FIG. 3.

Periosteal sarcoma of the upper end of the tibia.

the next slide. Precisely the same appearance is to be seen in Pearce Gould's second skiagram taken at a later date, but here, again, the picture is quite unlike that of a periosteal sarcoma. (I may mention that Pearce Gould claimed that in his case the appearance at this stage was evidence of his "cure by radium.")

Slide 10.—This slide shows a typical picture of a periosteal sarcoma growing from the upper end of the tibia. It is, as the slide clearly brings out, totally different from those of myositis ossificans. The shadows are no longer laminated or parallel to the surface of the bone, but are soft, blurred and ill defined, and they very obviously radiate outwards in every direction (fig. 3).

I think the best comparison we can make of this appearance is with that of smoke arising from a smouldering heap of leaves, and I consider this as absolutely distinctive and diagnostic of periosteal sarcoma.

Slide 11.—The last slide is a very interesting one, because it shows very clearly two types of shadow in the same skiagram. The patient was a boy, aged 11, with a history of slow septic osteomyelitis of the femur, and the upper half of the slide shows well-defined periosteal new bone of the osteomyelitis type. There was also a history of a subsequent blow on the outer side of the femur above the knee, followed by rapid swelling, which was explored and found, histologically, to be sarcomatous. The leg was amputated through the hip-joint, and the slide shows the skiagram which I took the same day of the amputated limb. In the lower third of the slide, on the outer side of the femur, you will see the blurred shadows radiating outwards in the manner which I have described as typical of periosteal sarcoma.

Finally, let me express the hope that I have not given the impression of being too dogmatic. Cases undoubtedly occur in which the interpretation of the X-ray plate is a matter of great difficulty, if not an impossibility, but whenever the appearances are so distinctive as in the examples which I have thrown on the screen, I think one is justified in being somewhat dogmatic. Moreover, what I have said is in close agreement with the views expressed by Coley in his paper on the differential diagnosis of periosteal sarcoma and myositis ossificans.

Mr. GILBERT SCOTT showed a number of slides illustrating the various bone tumours, benign and malignant. He pointed out that their effect on the normal bone was influenced in many ways, and was not only due to the particular tumour; the following were the chief points to remember:—

(a) The *type* of growth. Thus the tumour might be ossifying, partially ossifying, or non-ossifying.

(b) *Origin* of the tumour may be endosteal or periosteal, and situated centrally or to one side of the shaft.

(c) *Rate* of growth has a marked effect on the radiographic appearances. Thus a slow-growing myeloid sarcoma has quite a different appearance to the rapidly growing type.

(d) The *particular bone* affected.

(e) Method of *progress*. Thus an endosteal sarcoma may spread up the medulla, or burst through the bone and invade the soft tissues early.

(f) The *stage of growth* at the time of the examination.

(g) The presence of a *fracture*.

All these conditions have their influence on the radiographic appearances. It was not always easy to be certain of the nature of the tumour even from the microscopical examination, the pathologists often differing in opinion. The characteristics of the various bone tumours were illustrated by slides.



FIG. 1.

Osteoma (cancellous)



FIG. 2.

Fig. 2.—Chondroma (ossifying).



FIG. 3.

Fig. 3.—Chondromata (multiple non-ossifying).

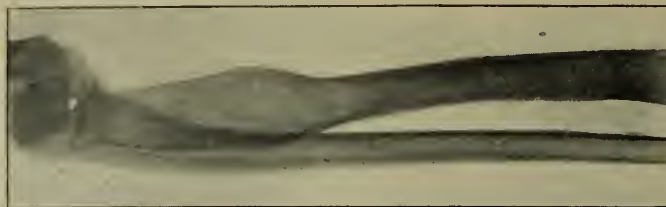


FIG. 4.

Cyst due to fibrocystic disease.



FIG. 5.

Fig. 5.—Endosteal sarcoma ("bone-eater").

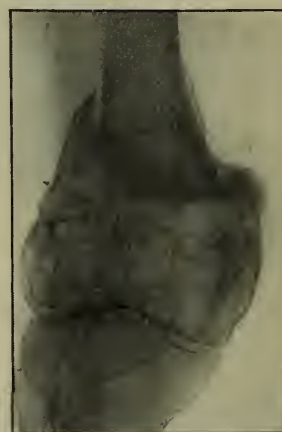


FIG. 6.

Fig. 6.—Endosteal fibrosarcoma (slow growth simulating a myeloid).



FIG. 7.

Fig. 7.—Myeloid sarcoma (fairly rapid growth).



FIG. 8.

Fig. 8.—Myeloid sarcoma (rapid growth).

BENIGN TUMOURS.

Exostoses of Osteomata. — Types: Ivory, cancellous. The ivory exostoses give a very dense shadow in the skiagram; usually situated in the skull; they may suddenly take on malignant changes. The

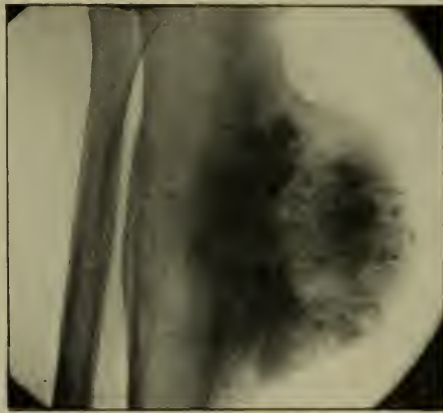


FIG. 9.

Periosteal sarcoma.



FIG. 10.

Secondary carcinoma.

cancellous forms are usually found near the epiphysis or joint, and directed away from it. Their structure is similar to that of normal bone: the wall is directly continuous with the compact layer of the

affected bone. Their growth may cause erosion of a neighbouring bone from pressure. They may be single or multiple.

Chondromata.—Types: (a) Complete ossification of the wall; (b) incomplete ossification; (c) non-ossifying. These may also be single or multiple. (a) If the ossification is complete, a globular, “egg-like” tumour is seen attached to the bone. (b) If incomplete, irregular patches of ossification are present, throughout the tumour, varying in density. (c) The non-ossifying forms only show alteration of the normal bone texture. If situated endosteally they produce expansion, and are often difficult to differentiate from other endosteal tumours. They are usually situated at the side of the shaft, and are commonly found in the metacarpal and metatarsal bones. They may rarely occur in the long bones.

Cysts.—The pathology of bone cysts is still doubtful. The majority of them are due to cystic degeneration of osteitis fibrosa. In these cases, if other bones are examined, cysts may be found. They may be caused by various diseases, and therefore present many confusing appearances. Two general types: (a) Fusiform expansion without trabeculation; (b) uneven expansion with irregular trabeculation.

MALIGNANT TUMOURS.

Endosteal Sarcomata.—True sarcoma and myeloid. The true endosteal sarcomata are usually of rapid growth, and may be described as “bone-eaters,” on account of the marked destruction of the affected bone. Thus, in this type trabeculation is not marked, if, however, as is sometimes seen with fibrosarcoma, the growth is slow, the trabeculation is present, and in this case the radiographic appearances closely resemble a myeloid. The origin of the tumour may be to one side of the shaft; the invasion of the soft tissues is then rapid, and the destruction of the bone itself small. In these case the surrounding bone loses its definition, and appears blurred, and the diagnosis is difficult. Myeloid sarcomata are usually slow-growing, and therefore trabeculation is a marked feature together with expansion. A rapidly growing myeloid may occasionally occur, then the radiographic appearance closely simulates a true endosteal sarcoma. However, rapidly growing myelomata and slow-growing true endosteal sarcomata are rare.

Periosteal Sarcomata.—(a) Non-ossifying rapid growth; (b) ossifying slow growth—(i) localized; (ii) general. (a) The non-ossifying type may only show erosion of the underlying bone; a few stray periosteal

striations may be found in the skiagram if examined from several points of view. If the tumour surrounds the bone, this appears rarefied and loses definition. Ossification may be found at the extreme edge of the stripped-up periosteum. (b) Here the periosteal striations are characteristic. In the localized type they appear as lines *radiating* from the centre of the tumour, arranged more or less regularly, and loosely packed; or they may be tightly packed, giving a more definite outline (lobulated). These may be sessile or pedunculated. In the *general* type these striations are arranged at *right angles* to the shaft, extending some distance up. If the tumour surrounds the bone the striations are more irregular in their arrangement, due possibly to their being viewed at different angles; some of them being foreshortened, their appearance suggest "smudges." The underlying bone is usually ill defined, and spontaneous fracture common. The denser and more closely packed the spicules the slower the growth, but this does not indicate the malignancy.

Secondary Carcinomata.—These are bone-destroyers, but the destruction seems to take place throughout the entire structure and not from within, as is seen with endosteal sarcoma. Spontaneous fracture is common, and may occasionally unite.

Dr. FRED. BAILEY (Brighton) showed a lantern slide of the upper end of shaft of humerus affected with round-celled sarcoma verified by pathological examination. The case was of interest because, three months before Dr. Bailey's X-ray examination, when the patient first suffered from pain, three excellent skiagrams had been taken by an unqualified radiographer. A correct interpretation of them had, unfortunately, however, not been arrived at, although one skiagram showed a most suspicious and typical "bitten-out" portion of the compact tissue of the humeral shaft. The present skiagram showed the whole upper part of the shaft affected and transparent to the X-rays—no new bone formation, although in origin the sarcoma was almost certainly periosteal, on account of extremely rapid growth—and marked difference between the medullary canals of the affected and unaffected humeri; the joint was apparently unaffected. He also showed on the screen a metacarpal bone in a woman, aged 35. The history was one of gradual enlargement; there was egg-shell crackling. The X-ray appearance made it doubtful to him whether it was not myeloid rather than enchondroma. As the patient had refused operation of any kind the diagnosis was not settled.

The CHAIRMAN (Dr. G. Harrison Orton) : We have seen this evening a very interesting and instructive series of slides, many of which demonstrated well the difficulties of diagnosis. With regard to spontaneous fracture being a sign of malignancy, a point maintained by one or two speakers, I think there is no doubt this is not the case ; a fracture is equally liable to occur at the site of a simple cyst. I was much interested in the cases of scurvy rickets shown by Dr. Ironside Bruce. Many years ago now I saw a child who nearly lost a limb, a diagnosis of sarcoma of the femur having been made on similar X-ray appearances to that shown by Dr. Bruce. Fortunately the child was seen by Sir Thomas Barlow, who was familiar with the appearances, and the child is now quite well. I do not think the shadows here indicate ossification in the clot, as they are quite dense in recent cases, but the appearances are typical of this disease, and errors should not be made in the light of our present knowledge. There is one thing we must always regard with suspicion, and that is any erosion of the bone, however small. An early periosteal sarcoma may show none of the spicules referred to and a very slight erosion of the bone may be the only X-ray sign.

An Apparatus for Cutting Out the Inverse Current without Valve Tubes when using the Mercury Break.

By REGINALD MORTON, M.D.

It would appear that for many purposes of the radiologist the mercury break has been under a cloud, especially for rapid radiography. This is unfortunate, because I am convinced that the mercury break has many unique advantages and is quite capable of meeting most of our requirements in a satisfactory manner. The chief fault of the modern mercury break is the relatively poor output of X-rays from the coil and tube it operates, and since the introduction of present-day high-voltage current from the main, and modifications in design of the break itself, the proportion of inverse current in the secondary discharge has been objectionably high. I think I have tested most of the modern mercury breaks and these objections apply to all of them. This falling off in efficiency is a serious matter and one for which I consider the instrument makers are entirely to blame. It was with the introduction from abroad of a high-speed mercury break that this decline commenced; it has gone on more or less ever since, and at the present time there is hardly a sign of an attempt to correct this downward tendency. If we go to an instrument maker's show-room with a view to purchasing such an outfit as I am considering we are shown one working that gives a tremendous discharge in air "practically as good as an electrolytic break." Needless to say, we are not told that a large portion of this discharge is reverse current, and for our purposes worse than useless. If such an outfit is bought it will be found that as a producer of X-rays its performance is distinctly poor.

In his desire for an impressive show-room display the maker has robbed the mercury break of nearly every advantage it has, and in doing so has violated every principle underlying its action. If we are to get the best results from a mercury break there are certain fundamental principles that must be observed, and any efforts at development must be made with regard to these, and my contention is that recent developments have been made on entirely wrong lines. In the first place, we must not allow the current to flow into the coil too suddenly if the reverse current in the secondary is to be kept down, and this necessitates the use of a certain amount of resistance in series.

Secondly, we must arrange the duration of "make" so that there is ample time for proper magnetization of the core (modern coils have large cores, and the larger the coil the longer time should be given). Thirdly, the "break" must be both sudden and complete. This last principle is about the only one met by the modern high-speed mercury break. They give a large number of interruptions per revolution of the motor and the latter is driven at high speed. The result is that some of them give a frequency of interruption amounting to over 200 per second. The duration of contact is necessarily very short and only a little resistance can be used. The current rushes into the coil very suddenly—increasing the current at "make"—and it is cut off before the core is properly magnetized—decreasing the current at "break."

There is only one test that has the least interest to the radiologist regarding his X-ray outfit, and that is its output in terms of useful X-rays, and as far as my experience goes with coils and mercury breaks, the more impressive the discharge in air the less useful will it be for X-ray purposes. The useful X-ray output of coil depends primarily on the intensity of the individual impulses, and secondarily on their number or frequency in unit of time. With every coil there will be found a frequency which must not be exceeded if the intensity is not to fall off, and this frequency will be found to be much lower than many think. Further, as we increase the intensity we must decrease the frequency, but so long as we keep the frequency as high as the intensity permits the total X-ray output increases. With most coils we use there is a limit beyond which we cannot go in this direction, and to take advantage of the very low frequencies the apparatus has to be specially designed; the extreme instance of this is the "single flash" apparatus.

Owing to magnetic saturation every iron core has its limit of capacity, and this in turn limits the output of the coil it belongs to. To obtain a large output we must use large coils with large cores, and these can be properly magnetized only by a sufficient number of ampere turns. There is a limit to the number of turns of wire that can be used, and to make up the necessary ampere turns we must use amperes. The modern high-speed mercury break can deal with only relatively small currents, and it is absurd to expect a large coil to give a good account of itself when linked up to an interrupter of about the size of a small American clock. When we use an electrolytic break we do not hesitate to pass currents of 20, 40, or even 100 amperes on occasion; such currents

are necessary to take full advantage of a large coil, and if a mercury break is to compete on even terms with the electrolytic break it must be designed to deal with these large currents. This is the only way we can get the high-intensity impulses that mean so much for X-ray purposes. Increase of frequency will never make up for loss of intensity, and this, in my opinion, is why the modern high-speed mercury break gives such indifferent results.

So far as my knowledge goes, such attempts as have been made to enable the mercury break to deal satisfactorily with large currents have not been successful, and this is the problem we have to face. While I am not yet prepared to state exactly the details of the successful mercury break for heavy currents, I feel sure we are within measurable distance of a solution of the difficulty. When this is achieved I venture to say the electrolytic break and the valve tube will pass into history, to the great benefit and relief of all of us.

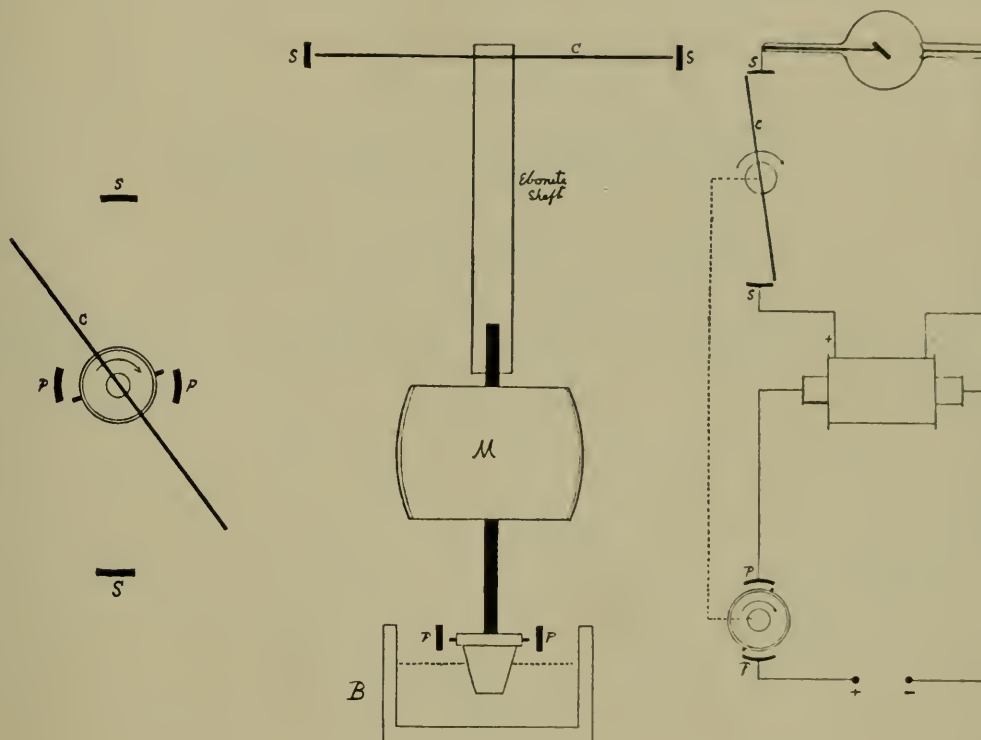
I may relate briefly a few simple experiments that will explain much of what has been said. My mercury break gives a maximum of four interruptions per revolution, and by opening a switch this number is reduced to two. A well-seasoned, water-cooled tube—No. 9, Wehnelt—was connected to the coil and the break set going at about ten revolutions per second and two interruptions per revolution. The current was adjusted so that the tube was carrying 1 ma., and a pastille was changed in eleven minutes. The tube was allowed to cool and fresh water put in. Everything else as before, except that the number of interruptions was doubled by closing the switch on the break. The current through the tube was now 2 ma., and the pastille was changed in just under six minutes. As I was well within the limit of permissible frequency for this intensity, the X-ray output was directly proportionate to the number of interruptions in unit of time. The character of the impulses was not altered, but only their number. Again, arrangements were made as at first, except that the speed of the motor was doubled, so that the frequency was the same as in the second experiment, though the duration of contact at “make” was only half as long as before. The current through the tube was now only 1.3 ma., and it took just under ten minutes to change the pastille. Radiographic experiments with a test object gave practically similar results. This shows that the shorter period of contact due to the higher speed almost nullified the increase in frequency, and yet this period of contact was about

three times as long as allowed in most modern mercury breaks. These simple experiments can be checked by anyone quite easily and I am sure a little investigation will prove the accuracy of these contentions. If you are using a high-speed mercury break, try the effect of running it as slowly as possible, using extra resistance if necessary, and if it gives eight interruptions per revolution have them changed for half the number but double the length. I venture to say that in every case there will be a marked improvement in the X-ray output, which will show itself on screen, plate, and pastille. If your break is so constructed that it will not work at sufficiently low speeds, then I advise getting one made on the lines I have adopted. If properly designed the jet break is as good as any that have been brought out. The pump should be of large diameter, the speed low, and the contact blades long, with a maximum of four interruptions per revolution. The interruptions, especially with large coils, should never exceed forty per second, and from twenty to thirty will usually be found best—when the flickering on the screen just ceases to be objectionable. It will be found that quite rapid work may be done and the quality of the work improved. All these ideas have for their object the decrease of the current at “make” and the increase of the current at “break”; these are the only objects to justify any alteration in design, yet recent developments have been in direct opposition. Let us hope we are at the end of this temporary aberration.

Now while the current at “make” is kept as low as possible by the adoption of these ideas, yet the fact remains that so long as we have to use currents of 200 volts and over it constitutes a real trouble and annoyance. Valve tubes are useful so long as they work well, which is seldom. They are all bad, though some less so than others, and they introduce one more variable factor into a problem that has too many already. I have devised a method of dealing with it that is quite satisfactory, and it is not my fault that it was not brought to notice three or four years ago. The principle can be applied to many forms of mercury break, and is not very different to the mica valve of Leslie Miller, but the idea is carried out in a much better way. It was not until after I had the first model working that I realized that the principle was essentially the same. My original idea was to apply the principle of the Snook machine to the induction coil, and turn the inverse current around and through the tube the correct way. But when I came to consider the relatively low voltage of the inverse current, and that it could not be productive of any useful X-rays.

I decided to leave it out altogether. This simplifies the apparatus very much without loss of efficiency.

In the accompanying diagram the arrangement is shown in elevation at the centre. The break (*B*) is driven by the motor (*M*), and on the upper prolongation of the motor spindle is mounted a stout ebonite shaft which carries a metallic connector (*C*), the break and connector thus revolving together. At diametrically opposite points the connector (*C*) just clears two segments (*S, S*), interposed in one side of the



secondary circuit. The segments (*S, S*) being adjustable around the centre of the shaft it is easy to arrange for the connector (*C*) to be on a line between the segments at the moment of "break"—the only time the secondary circuit need be closed. On the left of the diagram is shown the relation of parts at the moment of "make." The jets are just making contact with the primary contacts (*P, P*), and at this moment the connector (*C*) is separated from the segments (*S, S*) by a wide gap at each end. As the connector (*C*) approaches the segments (*S, S*) the current at "make" in the secondary dies out, and at the moment of "break" the secondary circuit is closed. This is shown at the right of the diagram, which also shows the connexions in the primary and secondary circuits.

As arranged the apparatus is very convenient, quite silent, except for slight crackling between the connector and segments, and perfectly efficient in suppressing the inverse current. It is not a rectifier, but rather a combined interrupter for primary and secondary circuits, working oppositely in each and in synchronism; that is to say, as the primary circuit is closed the secondary is wide open, and as the primary is broken the secondary is closed. The scheme introduces no complication likely to get out of order or require any adjustment beyond what is common to any other X-ray outfit. The conditions are constant at all times, there is nothing to burn, valve tubes are done away with, X-ray tubes are steadier and last longer, there is less heating, and results are improved all round. I do not think I fully realized the viciousness of inverse current, even in small amounts, until I came to work regularly with this apparatus. Needless to say, it can be adapted to any coil, and not the least advantage of the scheme is that it leaves the designer of induction coils free from what has been a serious restriction, and enables him to strive to attain the highest efficiency regardless of the amount of inverse current incidentally generated.

Electro-Therapeutical Section.

April 17, 1914.

Mr. C. THURSTAN HOLLAND, President of the Section, in the Chair.

Experiments in X-ray Filtration.

By R. W. A. SALMOND, M.D.

THERE can be little doubt that filtration is becoming an increasingly important part in X-ray technique, and is a subject upon which, at present, much difference of opinion exists. Certainly much heavier dosage is now given, with harder tubes and greater filtration, without affecting the skin, than could be given formerly with less filtration. The chief reason for bringing the subject up is to give some filtration equivalents which I have worked out in the Physical Laboratory of the Electro-Therapeutic Department of the Cancer Hospital. As various radiologists are using widely different materials as filters in treatment by X-rays, an attempt has been made to estimate their relative filtration values for the type of rays used in practice. Aluminium, which is, perhaps, the most widely used filter of specified thickness, has been taken as the standard of measurement, and the values of the other materials expressed in relation to it. It may be said at once that the reason why aluminium was chosen was not because it was considered to be the best filtering material, but for the above reason, and also because filtration through 1, 2, or 3 mm. of aluminium has a fairly definite meaning to most radio-therapists.

The technique for estimating these equivalents has been electro-scopic, and this is a more delicate and accurate method than a colorimetric one, where it is difficult to be very accurate in distinguishing slight variations of tints. The X-ray tube, enclosed in a well-protected box, was placed behind a lead screen, consisting of six plates 18 in. square, separated from each other by wooden blocks, the total thickness

of lead being $1\frac{1}{2}$ in. In the centre of each sheet was a circular aperture, so that an almost parallel beam of X-rays emerged at the opening in the distal sheet. Each of the apertures could be made of any desired diameter by the insertion of lead diaphragms. Directly in front of the distal aperture, the sheet of aluminium or other filtering material was placed in a plane at right angles to the beam, while in direct line with the latter was a gold leaf electroscope. This was of lead 1 cm. thick, except at one end, where a window of aluminium, $\frac{1}{5}$ mm. thick, permitted the X-ray beam to enter; the electroscope was connected with earth, and its leaf could be charged to a constant potential from a battery of 200 Leclanché cells. After blocking up the central apertures with solid lead, and making certain that the ionization due to any secondary radiations was constant and low, and that the natural leak of the electroscope was also constant and low, a sheet of aluminium of definite thickness was placed between the screen and the electroscope, the current (usually from 4 to 6 amp. in the primary and 1 to 2 ma. in the secondary) switched on, and the fall of the gold leaf, owing to ionization, accurately timed by means of a stop watch over a measured distance in an eyepiece scale. The sheet of aluminium was then removed, and the material whose filtration value was being estimated placed in the same position, and its thickness increased or decreased until the leaf fell through the same space in exactly the same time and under the same conditions. As will be seen, no correction for the natural leak of the electroscope and secondary radiation ionization need be made, for so long as each is constant and low it is simply a matter of getting the time readings of the two different filtering materials to correspond exactly. In carrying this out, the greatest difficulty was with the vacuum of the tube, for if this did not remain constant the value of the readings was, of course, *nil*. It was found that the relation between filters of high density and those of low density varied with the vacuum of the tube. This was very significant, for it clearly indicated that the relative filtration value between different filtering materials varied with the degree of hardness of the tube. To overcome this source of error, hard and well-seasoned tubes were used, corresponding to 7 to 10 Bauer (for the amount of current used), and, in addition, a sheet of aluminium 5 mm. thick was placed in front of the tube box. In this way slight differences in the penetration of the rays during the investigation were eliminated, and one was enabled to work with a beam of practically constant quality for some hours on end.

As exception may be taken to the aluminium, seeing that it is not present in the ordinary conditions of practice, it ought to be clearly explained why it was considered necessary to use it. Firstly, because the relative readings varied so much with tubes of different resistances, the softer the tube the higher the relative value of the filter of greater density, that it was impossible to tabulate equivalents which would have remained constant for tubes of different degrees of hardness. Secondly, because clinical evidence goes to show that therapists are using a harder ray than formerly, and the tubes used, though hard, were not so hard as some use and harder than others use. In this case, the aluminium allowed one to obtain an empirical beam from tubes of different hardness which, though varying within certain limits, yet allowed equivalents to be arrived at which remained practically constant for that variation in hardness. And thirdly, to counteract the increased penetration of the rays when heavier currents were used, for, just as it allowed the figures to remain approximately constant for tubes over a wider range of hardness, so here also it allowed these figures to remain approximately true over a wider range of current. At the same time, however, though the sheet of aluminium was used experimentally as a basis to get constant figures, the figures so obtained were tested for tubes in actual use for treatment without it being present, and they still remained approximately true, though over a slightly smaller range of hardness.

The materials whose filtration values were investigated were as follows: Tanned leather as obtained in boot-repairing shops, chamois leather, felt as supplied by X-ray instrument makers, the purest paper I could obtain, known as London Board, from Lechertier Barbe, Jermyn Street, W., and surgical lint of the usual hospital quality, thoroughly soaked in either a saturated solution of sodium tungstate or of lead acetate, and allowed to dry naturally. The filtration equivalents found for these various materials were as follows:—

Aluminium	Pure paper	Tanned leather	Chamois leather	Felt	Lead acetate lint	Sodium tungstate lint
0.5 mm.	3 mm.	3 mm.	10 mm.	13 mm.	1 layer	2 layers
1 ..	7 ..	7 ..	18 ..	30 ..	2 layers	4 ..
2 ..	13 ..	13 ..	35 ..	67 ..	4 ..	8 ..
3 ..	17 ..	16 ..	59 ..	97 ..	6 ..	12 ..

It may be added that these figures are the averages of some thousands of electroscopic readings, with different samples of the various materials. At the same time, it should again be emphasized that these equivalents are for hard X-rays as used in treatment, and not for those from soft tubes, and, as has already been shown, it is impossible to get equivalents that remain perfectly true for different degrees of hardness, these figures must be approximate, but are sufficiently accurate, I believe, for all hard therapeutic tubes. It is clear, on comparing the readings, that the figures for the different thicknesses increase or decrease in something approaching proportion, showing that though this is by no means a test of the homogeneous character of the beam, the quality of the beam is the same in all the tests with different tubes used. From the figures it would be possible to calculate approximately the relative values for greater filtration than that in the table. Glancing at the figures, it will be seen that aluminium has about six times the filtration value of either tanned leather or pure paper, while chamois leather and felt have a much less value, and that lead acetate lint has twice the filtration value of sodium tungstate lint.

The problem as to what is the best filtering material for therapeutic purposes will still at present depend largely upon the individual tastes of radiologists, and I do not believe it matters in the slightest what material is selected, provided a suitable thickness is used, and a proper method of using it is adopted. If it were not for the fact that many of the elements, except those of low, and perhaps also very high, atomic weight, give off characteristic fluorescent radiations under the action of X-rays, filtration would present little difficulty in practice. It would then have been to a large extent a question of density—the greater the density the less the thickness required, and vice versa; the one, however, not being a linear function of the other. Secondary radiations certainly introduce a new element of danger when using filters of materials which emit them, for they resemble, on the whole, the soft rays from a focus tube, in other words, the rays that are believed to readily set up dermatitis. This is the reason why it is necessary not only to take into account the thickness used but also the proper method of using any filter.

In the choice of material there seems to be various alternatives. Firstly, one may use a material composed of elements of low atomic weight, giving off no fluorescent radiations as yet detectable—for example, pure paper or felt; secondly, a material of comparatively low or medium atomic weight, and which emits a very soft and

very easily absorbed radiation—for example, aluminium; and thirdly, a material of high atomic weight, which has much greater power to filter, but at the same time gives off a less easily absorbed radiation—for example, tungstate lint. Although these three alternatives have been mentioned, it will be seen that they merge into each other; still it will, perhaps, be better to consider each of them separately.

The first — namely, material of low atomic weight — certainly appears to be the one least liable to give rise to unwished for effects. In practice, however, there is sometimes a difficulty in getting the larger thickness of material required between the tube and the pastille in the usual Sabouraud method, for, it will be agreed, the only accurate position for the filter is between the tube and the pastille. With the present construction of apparatus there may be this difficulty unless Kienbock's method is employed. Here the test paper is placed on the skin and a large amount of filtering material may be placed over it. The ordinary pastille might also be placed on the skin and measured by Corbett's or Hampson's scales. Suppose, for example, one wishes to filter with felt equivalent to 3 mm. of aluminium with a hard tube, one would, according to my figures, require about 4 in. thickness of the felt and this might not be conveniently got between the tube and the pastille at half-way distance. Felt is structurally very incompact and consequently of low density, but there are other materials of low atomic weight, much more compact, such as tanned leather, or pure paper, and these do not present so much difficulty in this way. Chamois leather is another useful material, especially to use in combination with metallic filters on their distal side to absorb any soft fluorescent radiations.

In the second class of filters is aluminium. It is the metal of lowest atomic weight for which a characteristic secondary radiation has been detected, though under the usual conditions this must be very small in amount. Filters of this material should not, therefore, be placed directly on the bare skin. If at a few inches off, it is difficult to see how any of the fluorescent radiations can reach the skin, as Widdington estimates that it only requires 4·7 mm. of air to absorb 50 per cent. of that radiation. It is, however, very easy to make it quite safe by placing some material between it and the skin. If chamois leather, lint, a towel, or some such material be used for this purpose, the very soft radiation will be absorbed, and aluminium will not then be found to be the dangerous filter that some have stated it

to be. A possible explanation of its bad effects in the past is either because it had been placed in direct contact with the skin, or because the tubes used for treatment were softer than they are used now, and consequently a larger amount of fluorescent radiations emitted, as these radiations are a function of the quantity of the primary beam absorbed by the filter—that is to say, if the tube is soft more will be absorbed by the aluminium and more fluorescent radiations produced. Barkla has estimated that never more than 40 per cent. of the primary beam is transformed into fluorescent radiations and that only a fraction of this escapes from the filter, if it is in the form of a plate.

With regard to the third class of filter, such as lint soaked in a solution of sodium tungstate, it should be clearly realized that one is really using, from an X-ray point of view, a metallic filter in spite of its non-metallic appearance. X-rays have no respect for molecules but pick out the atoms of tungsten, and emit from them a fluorescent radiation just as they would from particles of metallic tungsten. The radiations are certainly not all absorbed by the lint on which the particles have been deposited, for Russ has shown that the fluorescent radiations from lead and bismuth—elements of slightly higher atomic weight than tungsten—require about 1 mm. of aluminium to absorb them, and surgical lint I have found to be a very feeble filter. For this reason lints soaked in solution of salts of high atomic weight should, I think, have something between them and the skin, which has a filtration value of about 1 mm. of aluminium. It would be safer not to use aluminium for this purpose in case the radiation from the tungsten might excite fluorescent radiations in the aluminium, for the latter shows indications of being an exception to the rule that the exciting beam must be of greater penetration than the secondary radiation excited. In trying different salts, I found that lint soaked in a saturated solution of lead acetate and allowed to dry has approximately twice the filtration value of tungstate lint, and is, besides, a much cheaper and commoner salt. Either of these lints, however, can be made quite safe and acts as a powerful filter. Difference in the filtration value of tungstate lint compared with aluminium as observed by others might be due to the quality and thickness of the lint used, but the relation between the tungstate and lead acetate lints would, of course, not be affected by this.

It will be seen then, that though there are widely different methods used in filtration, all of them are safe if properly used; and if this be so, then the choice of material will still depend upon the individual

radiologist. Meanwhile we can only hope that at some near date a material will be found which is agreed upon as the ideal filter.¹

In conclusion, I would like to say that though the basis of this paper was worked out experimentally in the laboratory, the results obtained there have been put into practice for several months and found safe and reliable, and that I fully realize the difficulties and even dangers in trying to give definite figures to such things as X-rays, which seem at the present time to have no fixed constants at all. I also wish to acknowledge the kind help and suggestions of Mr. Phillips, Honorary Physicist at the Cancer Hospital.

DISCUSSION.

Dr. S. RUSS said, with reference to the tabular results of Dr. Salmond, that he would like to see the values of the densities of the materials put into the same table for comparison, as it was of particular interest to see whether aluminium was, weight for weight, a better absorber than substances made of the lighter elements. In view of what was known about secondary radiation, he thought that for safety metallic substances should not be used for screening purposes; some heavy material, such as compressed paper, consisting as it does of the lighter elements, seemed indicated.

Mr. S. GILBERT SCOTT said it was important that the distance of the filter from the anode should always be mentioned when the dosage of X-rays was given. He also asked if the statement of certain German radiologists that the hardness of the rays was increased by passing through thick aluminium filter was correct.

Dr. KNOWSLEY SIBLEY said that as a dermatologist he did not use filters to the same extent as those whose work had to deal with the treatment of more deeply seated conditions, where it was desirable to get penetration by as much of the hard rays as possible without injuring the skin with the soft ones, most of which were cut off by the interposition of various filters. At the same time, filters were very useful for the treatment of some of the pathological conditions of the skin, as for instance in lupus vulgaris, where it was more or less useless to treat only the superficial regions. So also in repeated and prolonged treatment for hirsuties, the interposition of filters undoubtedly rendered the

¹ A material called "Bakelite," with a density about equal to that of water and an opacity to X-rays approximately that of the soft tissues of the body, has recently been introduced. It may be had in sheets, and its use as a filter has already been suggested by Dr. Christen, but more as part of his ingenious method of measurement than for actual treatment. Bakelized paper can also be obtained. Unfortunately, these experiments were completed before this new substance was on the market, so I have not had an opportunity of estimating its relative filtration value.

treatment less risky. He had been greatly interested in the tabular form produced giving the absorptive properties of the various substances experimented with—aluminium, felt, chamois leather, lint, &c. He wondered where in this series the filter which all workers in X-rays used—namely, the human skin—would come. Of course, it must be obvious to all that the skin removed from the cadaver for experimental purposes would not be the same filter as the live skin with the blood circulating through it.

Dr. SALMOND, in reply, agreed with Dr. Russ that it would have been interesting to have had the densities of the materials used put in the table of results for comparison with their filtration values. He agreed with him that filters of the light elements were the safest, and with regard to compressed paper which Dr. Russ had mentioned, the credit was really due to Dr. Russ for having first recommended it as a filter. In reply to Mr. Gilbert Scott, he, too, had seen the statement that by passing a beam of X-rays through a sheet of aluminium 5 mm. thick the beam became harder, say from 10 to 15 Wehnelt, but he did not see how it was possible, though, of course, the proportion of hard rays in the beam after passing through the aluminium would undoubtedly be greater than before it had passed through. He agreed with Mr. Scott that when filtration was recorded the distance of the filter from the anticathode should be stated. He was sorry he could not answer Dr. Knowsley Sibley's questions as to which class of filter the human skin would come under. The material that it seemed to him to approach nearest in the table was chamois leather, but, as he had mentioned, "Bakelite" had an opacity to the X-rays about that of the soft tissues of the body. He was extremely interested in Mr. Thurstan Holland's remark that he used aluminium rolled up in boiler felt, as he had been in the habit of using a combination of aluminium and chamois leather with no signs of any bad effects.

Electrolysis in the Treatment of Hæmorrhoids.

By J. CURTIS WEBB, M.B.

IN no part of my general practice work have I found greater value from electro-therapy than in the treatment of hæmorrhoids, for, as is well known, an enormous number of people suffer more or less from this complaint, but dread an operation with its subsequent pain, and the chance of recurrence of the trouble at a future date.

Now I have elsewhere emphasized the fact that the value of any electro-therapeutic method is gauged by its superiority, in one or more respects, over previously used treatments, and I have satisfied myself that in the affection of which I am speaking, or rather in certain types of this affection, the claims of electricity demand recognition.

It will be remembered that hæmorrhoids are varicose enlargements of the terminal branches of the hæmorrhoidal plexus, forming swellings under the mucous membrane of the lower end of the rectum, or under the skin around the anal margin. The varicosity generally begins at the junction of the superior and middle hæmorrhoidal veins, while true external piles are caused by dilatation of the interior hæmorrhoidal branches. These hæmorrhoids are either internal, external, or intero-external, according to their situation in relation to the external sphincter.

As a rule, external piles give no trouble unless they become inflamed and thrombosed, and, in my opinion, there is no electric treatment for this condition equal to the usual surgical procedure of incising and turning out the clot. It is when we come to deal with the smaller sized internal or intero-external pile that the method of positive zinc puncture is so excellent.

There have been many treatments in the past whose aim has been to cure this troublesome condition by inducing obliteration by clotting through the medium of chemicals injected, but the clot formed is not firm, and there has always been a danger of some part of this clot becoming separated, and swept away into the general circulation, setting up a dangerous or fatal thrombosis or embolism elsewhere, and even this accident is not unknown after the usual treatment at the hands of a surgeon. On the other hand, the clot formed round positive needles is so firm that such an accident is almost impossible, at any rate

I have neither had experience of such, nor have I heard of it occurring after the procedure.

Let me say at once that I do not believe in electro-therapy for internal piles which do not protrude, and whose only symptom is free hæmorrhage, nor for those very large piles which are forced out on defæcation or from other cause. If once the size of the hæmorrhoid is such as to require a general anæsthetic for its treatment—and in cases of large piles I am sure it is necessary to dilate the sphincter thoroughly, a procedure which demands the administration of a general anæsthetic—then I think these cases are better handled by one of the recognized surgical methods. Even though I have seen a remarkably good result after treating a large pile by diathermy, yet, in my opinion, we are submitting our patient to an unnecessary risk in trying to cure the trouble by any method that relies on the production of a clot in a large pile, and to the cutting off of the blood supply, with the subsequent sloughing away of a considerable mass in a region that cannot be kept aseptic.

With small piles, that is to say, any that are about the size of a raspberry—the case is different. For such cases as these (1) a general anæsthetic is not necessary; (2) the sensations during treatment amount at most to discomfort, practically never to pain; (3) the pain after the treatment, which is usually slight or even absent, can be easily controlled by a morphia or a quinine urea suppository; (4) if the motion be kept soft there is little if any pain on defæcation; (5) the patients can usually return to their ordinary life two or three days after treatment. For example, if the patient is a business man, I try and get him to come for treatment on Friday afternoon, or at earliest on Thursday, with the assurance that he will be able to be back at his office on Monday morning. Of course, if the hæmorrhoid is approaching the maximum size that I referred to above convalescence may be a little longer, but I find this is rare, and especially since I learnt by experience not to try and do too much at a time. If there are several piles I treat the largest, and when that is completely cured I do the others. I find it better to give a patient two or three treatments at intervals of a fortnight or so, each attended with but slight discomfort, than to try and do it all in one complete treatment with the risk of pain and a longer convalescence.

The technique is simple. Having secured that the piles are as extended as possible, and the lower bowel empty, the patient lies on his left side on a table of convenient height. A large indifferent electrode,

attached to the negative pole, is applied all over the right thigh from hip-joint to knee. This must be large and in perfect skin apposition, as otherwise patients will complain more of the burning at the indifferent pole than by the pain at the site of treatment. The pile to be treated is now painted with the following: Phenol 30 gr., menthol 30 gr., quin. hyd., 22 gr., adrenalin pur. $\frac{1}{10}$ gr. I have found this far more efficacious than any solutions of cocaine, eucaine, &c. A hypodermic syringe with a very thin and sharp needle is now filled with Parke Davis quinine and urea hydrochloride solution, and after the local anæsthetic has had a minute or two to act this can be painlessly injected under the base of the pile parallel to its long axis. After about five minutes the pile is completely anæsthetic. Two or three zinc needles are thrust through the base of the pile parallel to each other, and to the long axis of the pile, and several more are plunged into the substance of the pile. Care must be taken in inserting the first lot of needles that they do actually go through the base of the pile itself, and are not merely embedded in the subjacent tissue. The correct position can be estimated by the amount of resistance offered to the passage of the needle. When the required number of needles are in place pack them round with oiled wool to prevent contact and burning of the adjacent skin, and then slowly turn on the current. I find I can usually get to about 15 ma. per needle; thus if there are six needles one can reach a current of about 100 ma. This, of course, is fairly high, and it is for this reason that the indifferent electrode must be as large as possible. The current is allowed to pass for about fifteen minutes, then gradually turned off, and, if necessary, reversed for a minute or so to allow of the withdrawal of the needles without force.

After the treatment the appearance of the pile has changed from the well-known purple-red to a greyish colour. I cover it with some such ointment as the adrenalin and chloretone, replace it, insert a $\frac{1}{4}$ -gr. morphia suppository, and send the patient home with instructions to go to bed and remain there thirty-six hours, and a dose of confection of senna and sulphur that night will insure a soft action next day, and the patient must be instructed that if then or at any time previously the pile should prolapse it must be *at once* replaced.

Usually in about ten days examination will fail to reveal any evidence of the existence of the hæmorrhoid, and the same process can be repeated on any others that may be present.

I have had no personal experience with diathermy in the treatment of hæmorrhoids. Though I possess the apparatus, I find electrolysis so

simple, satisfactory, and I think scientific, that so far I have seen no indication for giving it up. It has, further, one great merit over diathermy, in that it can be used by any practitioner who has a good galvanic battery.

The changes that take place in a hæmorrhoid as a result of this treatment and that bring about a cure are twofold. There is a cutting off of the blood supply from the walls of the vein through obliteration of the vasa vasorum, and at the same time the formation of a firm clot within the lumen of the dilated portion forming the pile. Thus we get a coagulation necrosis, and, if the pile be fairly large, it will come off as a small firm lump. If the pile be small it shrivels up and disappears. Frequently the only symptom of these small piles is a constant coloured discharge from the hypertrophied mucous membrane covering them, and this discharge is always cured by the electrolysis.

DISCUSSION.

Dr. TURRELL said that, in the electrical treatment of hæmorrhoids, diathermy was likely to prove more useful than electrolysis, because it was available for a far larger number of cases. Diathermy, unlike electrolysis, could be used with very marked benefit in the large group of hæmorrhoids which did not prolapse, but which were often the cause of profuse hæmorrhage, pain and irritation. To illustrate the lasting effects of this treatment he mentioned a case of acutely inflamed internal hæmorrhoids the pain of which was immediately relieved by the application of the high frequency vacuum tube, but at the end of a week the pain had returned almost as severely as before. This case was then treated by diathermy, with the result that the pain was completely removed, and in the interval of fourteen months which had elapsed since the treatment there had been no recurrence of the trouble. He also mentioned a case of very profuse hæmorrhage from internal hæmorrhoids where similar treatment had been followed by an equally long period of freedom from hæmorrhage. The treatment of these internal piles followed the lines of medical diathermy—a small cylindrical electrode was introduced and a current of 2 or 2·5 amp. applied for nine or ten minutes. So far from there being any pain connected with this treatment, there was not the least discomfort, and no after-treatment was required. In the case of prolapsed piles the treatment followed the lines of surgical diathermy. The protruded piles were painted with cocaine, and then a small electrode of about 0·5 cm. diameter applied until the patient complained of burning or until the patient could no longer endure the burning sensation. This treatment might be open to the criticism which had recently been made by a writer in a French paper against the use of diathermy in the treatment of lupus of the face, that it

was too "blind." It was difficult to judge from the immediate effect, when treating a mucous membrane or an ulcerated surface, what amount or depth of coagulation would result, this knowledge could only be acquired by experience. The surgical diathermy treatment if thoroughly carried out on extensive hæmorrhoids would often cause considerable after-pain necessitating the use of morphia suppositories. In these cases the cure was usually a permanent one.

Dr. KNOWSLEY SIBLEY said he was glad to hear of any treatment introduced by the electro-therapeutist which kept cases of this disease out of the hands of the surgeons. He had met with many disastrous results following operation by the knife, all the surrounding paraphernalia of such as nursing homes, the confinement to bed, making an invalid of a usually healthy subject, the distress of the anæsthetic, the pain following the operation, the inevitable morphia suppository, frequently the beginning of the morphia habit, and so on. He had not himself treated hæmorrhoids by ionization, or rather he would suggest that the treatment described was one of electrolysis, but he had had a large experience with these treatments for numerous other pathological conditions of the skin and external mucous membranes. With regard to the distress or pain described as arising from the inert pole, made by placing a large wet pad over some area of the skin, he never used pads for this purpose, but always placed the passive pole in a basin of warm saline water and put one or both of the patient's hands into this. This procedure was far more comfortable to the patient, and if complaint was made of the sensation of the current at the finger-tips, by directing the patient to close the fist this was obviated. By this method he had found that patients would permit a far stronger current to be used than when wet pads were applied. It also obviated the necessity of having partially to undress the patient before commencing treatment. Some years ago he treated a good many cases of hæmorrhoids by applying the vacuum electrode of the high frequency current, and he had always been quite satisfied with the results of this method, provided it was continued for a sufficient length of time. This treatment was painless and almost at once relieved what pain or discomfort there was, together with any pruritus ani, which so often accompanied this condition. He would suggest that all cases should first be treated with high frequency, and then any small rebellious piles or tags of skin which persisted should be dealt with according to the method under discussion. The general subject of the treatment of hæmorrhoids by the insertion of electric needles made him wonder whether this treatment might not be found of service in dilatation of veins in other regions—namely, varicose veins of the skin.

Measurements of Radium Rays as used Clinically.

By S. RUSS, D.Sc.

THE nature and characteristics of the rays emitted by the members of the radium series have been studied in great detail, and one may find in the literature of the subject quantitative data applicable to the rays given out by each member from radium to its final radio-active product, polonium. If the relative intensities of the rays under all circumstances were accurately known it would be possible to express the composite radiation in terms of these individual quantities; this composite radiation is the immediate concern of those engaged in radium therapy, and the following measurements have been carried out in order to provide data from which the general characteristics of the rays actually used under various conditions may be clearly seen. These measurements have been confined to the beta and gamma rays; the alpha rays from radium do not penetrate to a greater depth than 0.1 mm. of any tissue, and would therefore only come into consideration if the radium were administered as a drinking water or by intravenous or subcutaneous inoculation. The beta and gamma rays are heterogeneous to a marked degree, and although the statement that the beta rays are much more easily absorbed than the gamma rays is generally true, the recent work of Rutherford and Richardson¹ has shown that some of the softer gamma rays from RaB are more easily absorbed by aluminium than are the harder types of beta rays. Since the separation of beta rays by a magnetic field is not a practical clinical issue, it is not possible to say under all circumstances exactly what types of rays are being used, but we are nevertheless able to say to what extent they are absorbed by the tissues.

The two chief methods by which radium is used clinically are, either to spread the radium over a flat applicator, or to insert the radium in a small metal tube (usually of platinum) of thickness varying from 0.3 mm. to 1.5 mm. or more. The flat applicator will first be considered. Varying with the thickness of varnish covering the radium, the radiation will consist of a varying quantity of beta and of gamma rays. When such an applicator is applied to the superficial tissues it is desirable

¹ *Philosophical Magazine*, 1913, p. 722.

to know how the intensity of the rays decreases in the successive layers of the tissue. It decreases because of the spreading out of the rays from the source, and also because of the absorption which the rays suffer as they make their way through the succeeding layers. It will be seen from the subsequent data that as far as the beta rays are concerned the absorption by the tissues determines this decrease in intensity very much more than the increasing distance does, but that the decrease in the gamma ray intensity is much more due to the distance effect than to the absorption that they suffer.

The radiation from a flat applicator has been studied in the following manner: A shallow cylindrical box of aluminium, 2 mm. deep and 4 cm. diameter, was provided with a mica window, thick enough to stop all the alpha rays. This box was filled with about 10 milli-curies,¹ and when the active deposit (RaA, RaB and RaC) had reached its equilibrium value, measurements were made of the composite radiation

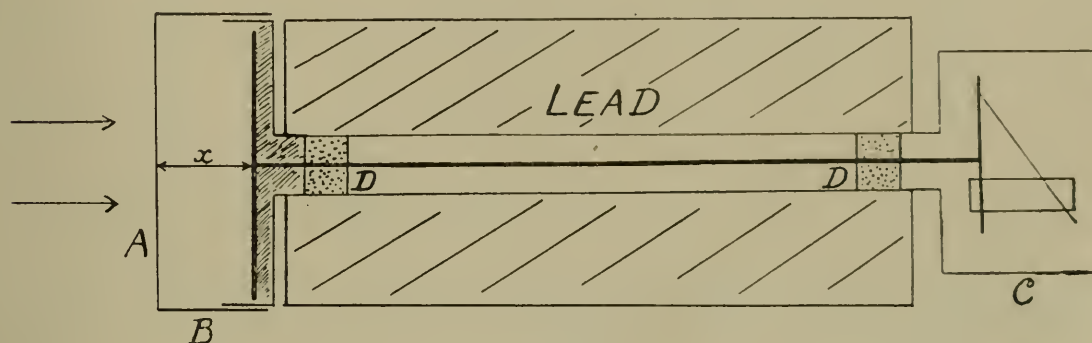


FIG. 1.

emitted from it. This was done in the following manner: The applicator was mounted in line with an ionization chamber (B) (fig. 1), an aluminium disk which was connected by a wire running through the amber plugs (D, D) to a small gold leaf electroscope (C). The rays entered B through a very thin aluminium window (A) (about 0.001 mm. thick), and ionized the air in this vessel, which was measured by the rate of movement of the gold leaf in C, the rays being practically excluded from C by an intervening mass of lead 10.5 cm. thick. The cylindrical ionization chamber (B) was 4 cm. diameter (the same as the applicator), and the depth x could be varied as required; it was generally 1.2 cm.

The composite radiation from the unscreened applicator is very

¹ One milli-curie is the amount of emanation in equilibrium with 1 mgr. of radium.

rapidly absorbed by aluminium sheets placed in front of the vessel *B*. This may be seen from the lowest curve (fig. 2). The ionization is reduced to about one-tenth of its initial value in going through 0.9 mm. of aluminium. The applicator was now screened with 1.5 mm. of aluminium, and the character of the emergent rays again determined.

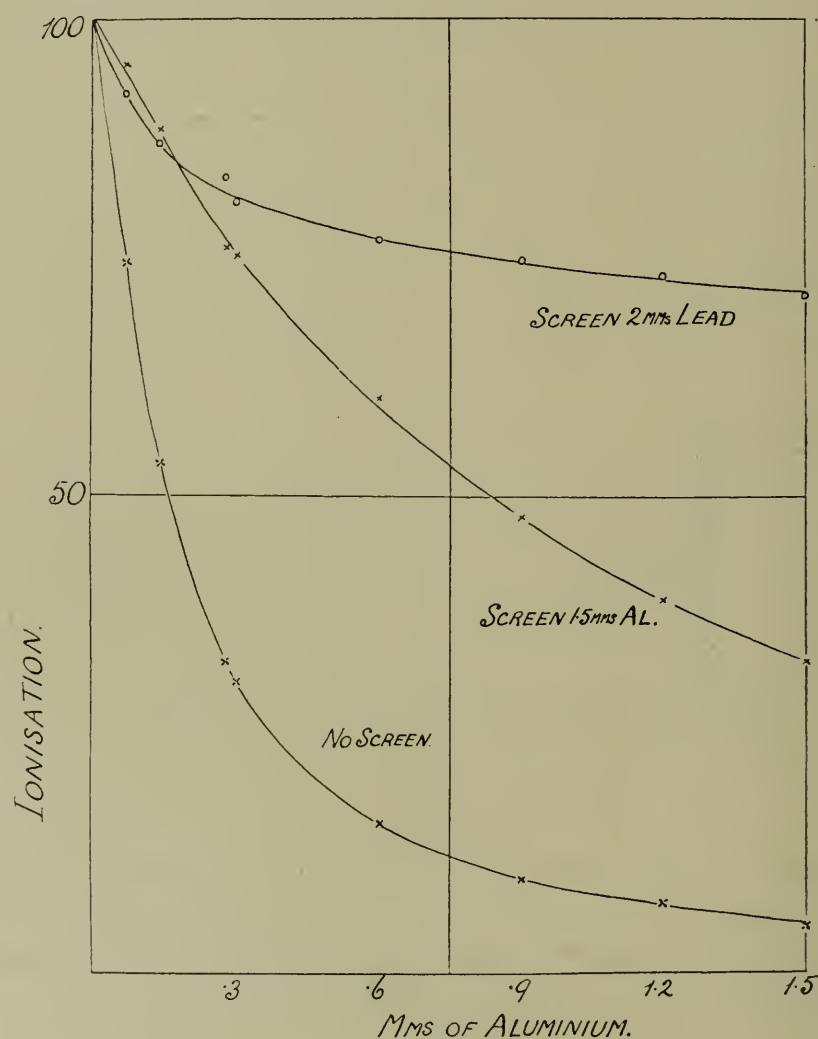


FIG. 2.

From the middle curve of the same figure it will be seen that 0.9 mm. of aluminium now reduces the ionization to 47.5 per cent. of its initial value, instead of to 10 per cent., as in the previous case; this part of the composite radiation is of moderate penetrating power (about that of X-rays from a bulb running at 5 to 6 cm. spark-gap, the softest rays excepted). The applicator was then screened with 2 mm. of lead, and a similar series of measurements made. The data of special interest

here are those at the beginning of the top curve of the same diagram. They show that there is a soft component present (almost certainly secondary gamma rays produced in the lead), which actually makes the curve dip below the preceding one, although the bulk of the radiation, as the rest of the curve shows, is much more penetrating. The numerical data for these three cases of the composite radiation will be found in Table I.

TABLE I.—ABSORPTION OF COMPOSITE RAYS FROM FLAT APPLICATOR.

Thickness of aluminium		No screen. Ionization		Screen 1.5 mm. aluminium. Ionization		Screen 2 mm. lead. Ionization
0	mm.	100	...	100	...	100
0.07	"	74.0	...	95.1	...	92.2
0.14	"	53.6	...	88.5	...	87.0
0.28	"	32.4	...	75.8	...	83.3
0.3	"	30.2	...	75.0	...	80.6
0.6	"	15.0	...	60.0	...	76.6
0.9	"	9.4	...	47.5	...	74.6
1.2	"	6.6	...	38.8	...	72.8
1.5	"	4.7	...	32.4	...	70.8
3.0	"	—	...	—	...	66.3
4.5	"	—	...	—	...	64.2
6.0	"	—	...	—	...	63.3
9.0	"	—	...	—	...	60.6

THE ABSORPTION OF THE COMPOSITE RAYS BY TISSUES.

The heterogeneous nature of the composite radiation having been studied in aluminium, the extent to which the more easily absorbed of these rays (curves 1 and 2) penetrate various tissues has been found. The tissues were those of the sheep; they were mounted on wooden blocks, frozen, and thin layers (0.65 mm. thick) cut with a large size microtome and then mounted on a thin mica frame in front of the window of the ionization vessel. The absorption by the tissues of the unscreened rays from the applicator was first measured, and then when the rays were screened by 1.5 mm. of aluminium, the data for which are collected in Table II (p. 96).

When these data are plotted out on diagrams the same general features are noticed as when the rays are absorbed by aluminium—viz., a very rapid absorption of the unscreened rays, which becomes less marked when the rays are screened. From the data it may be seen whether the tissues absorb the rays as their densities would suggest, and by direct comparison between the numbers with those for aluminium (Table I) whether they are, weight for weight, such efficient absorbers. From the general trend of the decrease in ionization in going through

the same thickness of muscle, liver, spleen, &c., it will be seen that the denser the tissue the more it absorbs. After traversing about 3 to 3.4 mm. of these tissues the unscreened composite radiation is reduced to about 5 or 6 per cent. of its initial value.

TABLE II.—ABSORPTION OF COMPOSITE RAYS FROM FLAT APPLICATOR.

No screen.

Thickness of tissue	NATURE OF TISSUE					
	Muscle (density 1.25). Ionization	Liver (density 1.21). Ionization	Spleen (density 1.17). Ionization	Brain (density 1.12). Ionization	Fat (density 0.92). Ionization	
0 mm.	100	100	100	100	100	
0.65 "	32.5	36.0	36.7	36.8	40.2	
1.30 "	—	18.0	—	—	—	
1.95 "	10.3	11.4	12.4	12.2	13.0	
3.25 "	4.5	5.4	5.8	5.7	6.4	
4.55 "	2.3	3.5	3.1	3.5	3.4	

Screen 1.5 mm. aluminium.

Thickness of tissue	Muscle. Ionization	Spleen. Ionization	Brain. Ionization
0 mm.	100	100	100
0.65 "	85.5	90.0	—
1.95 "	62.0	56.2	57.0
3.25 "	43.0	41.4	36.6
4.55 "	26.3	29.9	26.7

A comparison of the absorbing powers of these tissues with that of aluminium is made by finding the reduction in the ionization that a certain thickness of tissue causes, and then finding from the bottom curve (fig. 2) the thickness of aluminium which causes the same diminution in the ionization. If the ratio of the thickness of tissue to that of aluminium is the inverse of their respective densities, then the tissue absorbs according to a simple density relation. This has been tested and the results collected in Table III. The last column, which should

TABLE III.

Tissue	(a)		(b)		Ratio a/b
	Thickness of tissue	Thickness of aluminium	Density of aluminium	Density of tissue	
Muscle	...	2.38	...	2.17	1.10
Liver	...	2.60	...	2.24	1.16
Spleen	...	2.79	...	2.32	1.20
Brain	...	2.75	...	2.42	1.14
Fat ...	...	2.91	...	2.94	0.99

be unity if the above density relation holds, shows that muscle and fat absorb the rays very nearly according to this simple density relation,

but that for the other tissues aluminium is a rather more effective absorber, weight for weight, than they are, the spleen appearing to be the least efficient. The effect of any secondary radiation given out by the tissues would be to make them appear as less efficient absorbers. A similar procedure with the screened rays shows that the ratio a/b is 1.14, 1.22, and 1.07 for muscle, spleen, and brain respectively.

Absorption measurements are more easily and accurately made with a substance like aluminium than with tissues. When the coefficient of absorption (λ)¹ of some radiation has been found in aluminium, the above measurements indicate that no very serious errors would generally be introduced if the coefficient of absorption of these same rays in a tissue were reckoned from the simple relation—

$$\text{Coefficient of absorption in tissue} = \text{coefficient in aluminium} \times \frac{\text{density of tissue}}{\text{density of aluminium.}}$$

In blood-containing organs such as spleen, liver, &c., however, this process would probably give rather higher values than the actual absorption coefficients.

THE RADIATION FROM RADIUM IN PLATINUM TUBES.

When salts of radium are enclosed in platinum tubes the radiation emitted is mostly of a penetrating character, a thickness of 0.3 mm. being sufficient to absorb all the soft, and a considerable proportion of the moderately penetrating beta and gamma rays. Even so, however, the composite radiation through 0.3 mm. of platinum consists not only of the very penetrating rays but of some components which are only completely cut out by an additional 1.2 mm. of platinum (1.5 mm. in all, or 3 mm. of lead).

The method by which such measurements are made has already been indicated: the tube containing the radium is mounted at a suitable distance from the ionization vessel, and the gradual reduction observed when layers of aluminium are interposed between them. The general character of this radiation may be seen from curves (1) (2) (3) and (4) in fig. 3, corresponding to thickness of platinum 0.3 mm., 0.5 mm., 1 mm., and 1.5 mm. respectively. Inspection shows that the rays

¹ The coefficient of absorption (λ) is obtained from the relation $\lambda = \frac{2.301 \times (\log_{10} I_0 - \log_{10} I)}{d}$

where I_0 = initial intensity of the rays.

I = intensity after going through a distance d .

emerging through 1.5 mm. are all of a very penetrating character. For a thickness of 1 mm. there is a small percentage of moderately penetrating rays. Curve 2 shows that for a thickness of 0.5 mm. (tubes of this thickness are very often used clinically) about 20 per cent. of the ionization is due to the moderately penetrating rays. The effect of

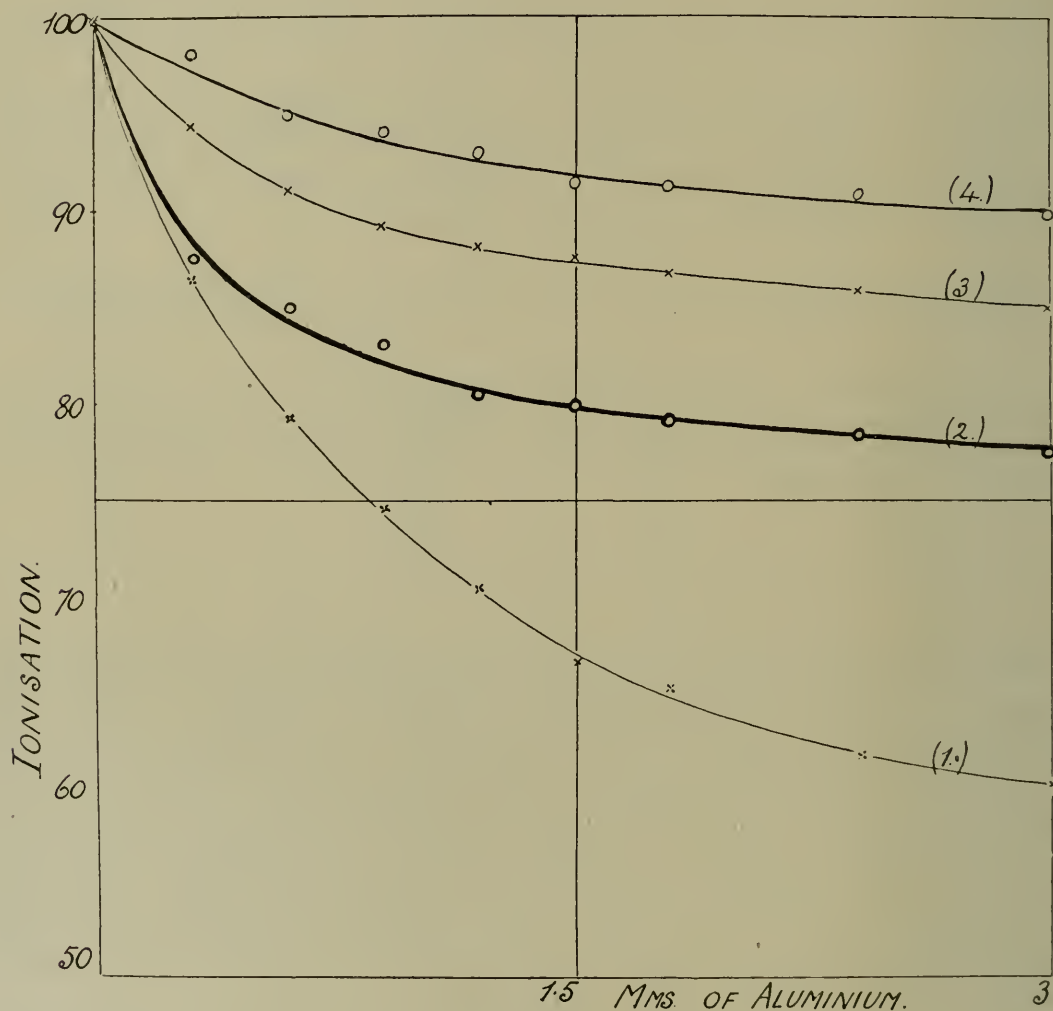


FIG. 3.

screening such a tube with an additional millimetre of platinum is to cut out all except the very penetrating rays. The presence of the moderately penetrating rays is more evident still when the platinum is reduced to 0.3 mm. The numerical data from which the curves are drawn are collected in Table IV.

TABLE IV.—ABSORPTION OF RAYS FROM PLATINUM TUBES.

Thickness of aluminium		(1) 0.3 mm. platinum. Ionization		(2) 0.5 mm. platinum. Ionization		(3) 1 mm. platinum. Ionization		(4) 1.5 mm. platinum. Ionization
0	...	100	...	100	...	100	...	100
0.3	...	86.5	...	87.5	...	94.5	...	98.2
0.6	...	79.2	...	85.0	...	91.2	...	95.0
0.9	...	74.4	...	83.0	...	89.2	...	94.0
1.2	...	70.2	...	80.5	...	88.2	...	92.9
1.5	...	66.4	...	79.8	...	87.5	...	91.6
1.8	...	65.0	...	79.0	...	86.8	...	91.3
2.4	...	61.8	...	78.2	...	85.8	...	90.7
3.0	...	60.0	...	77.2	...	84.8	...	89.6

THE DIMINUTION IN INTENSITY OF THE RAYS IN PENETRATING THE TISSUES.

Confining our attention to the two typical cases—viz., the flat applicator and the metal tube—if it were known how the radiation, apart from absorption, varies in intensity at different distances from the source, the data necessary for finding the intensity of the rays at any required depth in the tissues would be at hand. To determine the values of the radiation at different distances the same apparatus as in fig. 1 was used, except that the depth (x) of the ionization chamber was reduced from 12 to 3 mm., this being as shallow as could be conveniently used. The flat applicator was then placed at distances 1, 2, 3 to 10 cm. away from the face of the ionization chamber, and the respective values of the ionization due to the beta rays observed. The values obtained are collected in Table V, the value at a distance 1 cm.

TABLE V.—DECREASE OF RADIATION WITH DISTANCE. NO ABSORPTION.

Distance			Flat applicator		Tube
1 cm.	...	...	100	...	100
2	„	...	64.8	...	60.5
3	„	...	43.8	...	38.4
4	„	...	31.2	...	25.8
5	„	...	22.7	...	18.2
6	„	...	17.0	...	13.7
8	„	...	10.7	...	8.4
10	„	...	7.7	..	5.8

being taken as 100, and a small correction applied to the values at the other distances to allow for the absorption of the rays by the air between the applicator and the vessel. A similar series was obtained for the radiation from a small tube 2.5 cm. long placed at different

distances along the axis of the same shallow ionization vessel. These values, also corrected for the absorption of the air, are to be found in the same table. It will be observed that the radiation falls off more quickly from the tube than it does from the flat applicator.

To find the varying intensity of the rays as they go through some tissue of the density of water let us assume two typical clinical cases:—

(1) Radium in flat circular applicator, 4 cm. diameter, screened by 2 mm. of lead and the soft components (*vide* fig. 2) cut out by a few layers of lint.

(2) Radium in platinum tube 1.5 mm. thick, 2.5 cm. long.

Case 1.—After going through 2 mm. of lead and the layers of lint the rays are still not homogeneous but consist of moderate and very penetrating rays, with the result that the absorption coefficient in aluminium gradually diminishes. This was measured for varying thicknesses up to 9 mm., and by plotting logarithmically all the data in column 4 of Table I it is found that after going through 3 to 4 mm. of aluminium—i.e., approximately 1 cm. of tissue—the rays are all of the very penetrating type with a coefficient of absorption in aluminium of 0.142 cm.^{-1} , and therefore in tissue $\frac{0.142}{2.71} = 0.0524 \text{ cm.}^{-1}$. With the help of this number the data in Table VI have been obtained showing the decrease in the ionizing value of the rays after going through the

TABLE VI.—ABSORPTION OF COMPOSITE RADIATION BY TISSUES.

Thickness of tissue			CASE 1. Flat applicator		CASE 2. Metal tube
1 cm.	...	...	100	...	100
2 "	...	...	84.0	...	92.7
3 "	...	...	79.6	...	85.9
4 "	...	...	75.7	...	79.6
5 "	...	...	71.8	...	73.8
6 "	...	...	68.2	...	68.4
8 "	...	...	61.4	...	58.8
10 "	...	...	55.3	...	50.5

given thicknesses of tissue, simply on account of the absorption. The value at 1 cm. is taken as 100, the value of 2 cm. is got directly from the absorption curve, fig. 2, and the others calculated from the above coefficient.

Case 2.—A similar procedure has been carried through here; the rays which pass through 1.5 mm. of platinum are all of the very penetrating type with an "effective" co-efficient of absorption in aluminium of 0.205 cm.^{-1} , and therefore in tissue $\frac{0.205}{2.71} = 0.076 \text{ cm.}^{-1}$. The

numbers given in the same table are calculated directly by means of this coefficient. (The different values of λ are due to the different experimental conditions.)

The data are now available for finding the intensity of the rays at any particular depth of tissue for these two cases. If the radiation number, Table V, is multiplied by the corresponding absorption number, Table VI, the product gives the intensity of the rays at the depth in

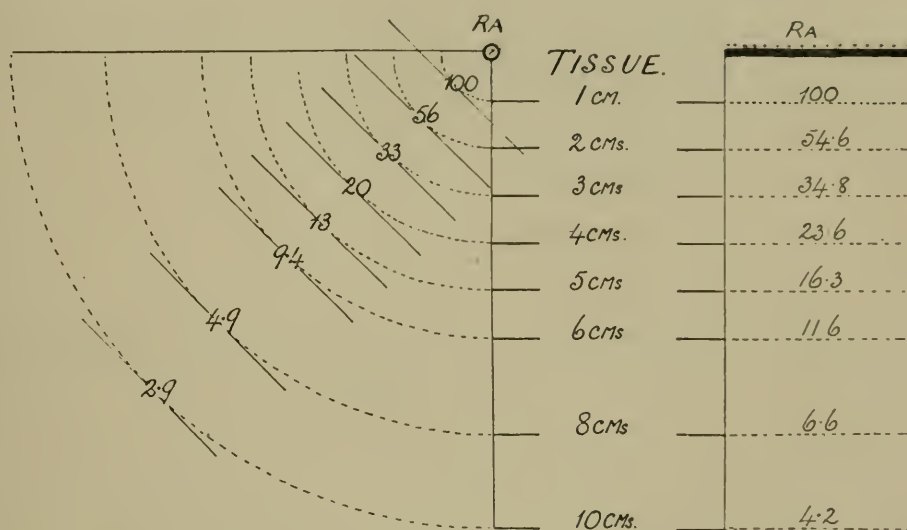


FIG. 4.

question. These values at each depth, that at 1 cm. again being taken as 100, are given in Table VII and reproduced in fig. 4. The radiation

TABLE VII.—INTENSITY OF RADIATION AT DIFFERENT DEPTHS OF TISSUE.

Depth of tissue			CASE 1. Flat applicator		CASE 2. Metal tube
1 cm.	...	...	100	...	100
2 „	...	...	54.6	...	56.0
3 „	...	...	34.8	...	33.0
4 „	...	...	23.6	...	20.0
5 „	...	...	16.3	...	13.0
6 „	...	...	11.6	...	9.4
8 „	...	...	6.6	...	4.9
10 „	...	...	4.2	...	2.9

from the applicator diminishes less rapidly than that from the tube except for the first centimetre, in which the more absorbable rays are stopped. From the data given in Tables I and IV cases corresponding to different thicknesses of platinum and lead shields may be dealt with.

DISCUSSION.

Dr. FINZI asked Dr. Russ whether he thought one layer of lint was sufficient to cut off the secondary radiations. With regard to the increased effect obtained at a depth when a plaque of radium was used compared to when a tube was used, he suggested that this was probably due to the fact that the source of the radium rays covered a much larger area in the latter case.

Dr. RUSS, in reply, said that with regard to the lint, it had been assumed that a sufficient amount was used to cut off the secondary rays from the lead. The radiation from the disk decreased more slowly with the distance than that from the tube, entirely on account of the manner of its distribution.

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OF THE
ROYAL SOCIETY OF MEDICINE

VOLUME THE SEVENTH

COMPRISING THE REPORT OF THE PROCEEDINGS FOR THE
SESSION 1913-14

Section 8.
SECTION OF EPIDEMIOLOGY & STATE MEDICINE



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Section of Epidemiology and State Medicine.

October 24, 1913.

Dr. W. H. HAMER, President of the Section, in the Chair.

Working-class Home Conditions in London.

By W. McC. WANKLYN.

THE branch of London housing dealt with in this paper concerns the internal administration of the home, regarded as the woman's workshop or place of management; and I am very glad to respond to the President's invitation to read some notes which I had made on the subject. It will be understood that it is not sought to deal with the subject in its entirety; that is not practicable; what is here given is only an attempt to record faithfully some existing conditions as they presented themselves to the writer. No thesis is followed or conclusion sought.

The subject-matter of the paper may be stated in a few words. It is an estimate of the number of persons in London living in houses let in lodgings, together with a description of what life in some of these premises means. An account of the work of the late Miss Octavia Hill is added.

There is grim irony in a recent remark of some German visitors, that they were struck by the absence of tenement-buildings in London as compared with their own towns. That is the first and natural impression of a stranger; and certainly in London there are few block-dwellings in comparison with the number of individual houses. What is, however, not at first perceived, is that very many of our houses only pretend to be houses, and in reality are nothing of the kind. They are tenement-buildings, in effect. Since the houses were built a sinister change has taken place within them. The interiors are no longer used each for a single family, but now receive two or more families; usually there has been no structural alteration; and so it comes about that tenements in these houses are not properly constructed tenements at all, but merely groups of individual rooms. The house front remains

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unchanged and forms a veneer which conceals the ugly reality within. The familiar term "Houses let in lodgings" simply means that houses designed, constructed, and intended for the use of one family are actually occupied, without material alteration, as the dwelling-place of two or more separate families.

A word is necessary about the terms in use. The term "lodgings" in the phrase "Houses let in lodgings" is misleading. "Lodgings" is a word which commonly carries the meaning that rooms are let to temporary, and often single, occupants, by some person resident on the premises, who manages such rooms. The term "lodgings" in "Houses let in lodgings" means something quite different from that. It means that the rooms are occupied, usually, by a man and wife and family; that the rooms are furnished by them and form their home; that no one else has any right to enter, and that there is no one else resident on the premises to look after the rooms. There is no word in existence, so far as I know, which is used exclusively to denote this kind of dwelling. The word "flat" is the nearest approach, but to describe homes of this class in London the word tenement is in common use. In strictly correct language, no doubt, the word tenement has a wider meaning, as, for instance, when used by the Registrar-General in the Census Returns; then it means any self-contained dwelling, whether a mansion, cottage of four rooms, single room used by one family, a van, canal-boat, or any other habitation: in fact, any dwelling-place occupied by one family. It is well to grasp the distinction between the two meanings of the word, and to realize that when the word tenement is used in this branch of work it usually means what might be called a mean flat.

The first question is, How many tenements are there in houses let in lodgings, and what is the population housed in them? The figures of the 1911 Census show that there were in London in that year 718,565 tenements each of from one to four rooms, the population housed by them being 2,627,934.

This figure, however, exceeds the actual number we are seeking, inasmuch as it denotes the number of tenements of all kinds, including, for instance, single houses of four rooms and also tenements in block-dwellings. To arrive at the number of tenements actually existing in houses let in lodgings certain deductions have to be made.

As to the number of tenements of four rooms and less in block-dwellings, the Medical Officer of Health of the London County Council made inquiry in the year 1906. He estimated them to be 53,571; that is, 7.9 per cent. of the total number, namely 672,030, of tenements of

from one to four rooms (Census, 1901). Whether this percentage has since increased or decreased I have no information; but for the purpose of this paper it is assumed to be the same. A deduction has also to be made on account of two-, three-, and four-roomed houses which are included in the term "tenements" of from one to four rooms. Only a rough estimate of the necessary deductions can be made; but I doubt if it exceeds 10 per cent. If that be taken, it means that a deduction of 71,856, on account of tenements other than those in houses let in lodgings, has to be made from the above-named total of 718,565. If this be done, the tenements in houses let in lodgings come out at 646,709, housing 2,365,131 persons. That is to say, one-half of the total population is housed in this fashion.

The second question is, What is the nature of these tenements? Some answer may be given by the following descriptions; they are taken from notes made by myself on the spot in April, 1912:—

— Street is a perfectly straight street, about 250 yds. long, and about 22 ft. across from house to house. Each end is bounded by and terminates in larger streets which run at right angles; there is little wheeled traffic through the street. It is paved with asphalt, the paths with York stone; the paving is in good repair, and for the most part free from pools of water and from refuse. The houses give direct on to the footpath; there are no forecourts. Ventilation through the street is deficient owing to its narrowness, and because each end is overshadowed by comparatively high buildings. The street is remarkable for the absolute uniformity of its houses, for its regular, drab and unkempt appearance; there is nothing whatever fresh or bright about it. In fine weather groups of women gossip at the house doors, and infants and children play about, most of whom are dirty, ill-clothed, and ill-cared for.

Two old residents, one of whom has lived in the street for twenty-seven years, the other for sixty years, state that the character of the street has changed very much since they first knew it. "It used to be one of the best turnings" (off the main road, that is). Each house was then occupied by one family and no more; lodgers might be taken in, but no parts of houses were let to separate families. It was full of small shops and businesses. The father of the older woman had been a brass finisher and turner. The houses were then kept clean and well painted; the street looked thriving; but now it had lost its reputation. The brass finisher was thought to have lost customers because they did not dare to do business with people living in that street. This drawback is so much worse at the present day, that one of the women quotes

her son, who is a clerk in the City, as often saying that he dare not say where he lives or he would lose his place. One of the most remarkable things about the locality is the total absence of colour and form and vegetation.

Of the seventy-six houses in the street, seventy-four are now let in lodgings, that is to say, each house contains two or more separate families, who live apart from each other, and occupy different sets of rooms as flats or tenements. The seventy-four houses contain 217 tenements, each of these tenements serving as a home.

No. M.R. is rented by Mrs. Z., who herself occupies a tenement of three rooms—viz., the ground floor and the back room on the first floor. Her own party consists of herself and two daughters, her son, and two men lodgers—six persons. The front room on the first floor is occupied by an elderly widow who lives by herself. The top floor, an attic, is to be let (April, 1912) to a family of other persons; it consists of two rooms, one at the front and one at the back. It is instructive to see it in its empty state. The accommodation is easily stated. The front room has a kitchen fireplace and a cupboard set in the wall; the back room has no fireplace; each room has a door and window. That is all. That forms a complete “home,” or habitation, or tenement for a family.

When stated in this brief way the real nature of the home conditions may not at once be obvious, and it will be convenient to make a comparison with premises which are reasonably fit for human habitation, so as to see what is necessary for health and decency. For this purpose there may be pictured a self-contained flat of good quality or a well-built cottage. Here we find:—

- (1) A separate entrance, and the privacy which that implies.
- (2) Sufficient sub-division of the total interior cubic space to allow of decency and comfort.
- (3) A certain minimum of measurements observed, in the width of passages and dimensions of rooms, which self-respecting people require for freedom of movement, to avoid, for instance, brushing up against other people or the sides of passages.
- (4) One separate living room, or more.
- (5) One separate bedroom, or more.
- (6) A food store or larder.
- (7) A scullery for washing up and storing crockery.
- (8) Water-closet, forming also a slop sink.
- (9) A washhouse.
- (10) A coal and wood store.

There is also arranged :—

- (11) A cold water supply.
- (12) A cooking range with automatic hot water supply.
- (13) A drying ground for washed clothes.
- (14) Air and floor space for children to get play and exercise.

Some of these requirements are sometimes considered to be luxuries and unnecessary, but in point of fact they are the necessary minimum for the health of the occupants ; and also for the all-important decency and self-respect, upon the observance of which their health depends.

The item last mentioned in the foregoing list is one of the most important. The young of all animals, such as kittens and puppies for instance, require air and room in which they can properly exercise their natural movements. It is an absolute physical necessity for their health. Human young form no exception to the rule. The absence of play room brings a plentiful crop of ill-health.

Bearing these conditions in mind, we can now return to the tenement first mentioned. It comprises the two top rooms of a small house, without any offices, conveniences, or adjuncts of any kind, except a wall cupboard. The front room measures 14 ft. by 11 ft. by 6 ft. 6 in., and the back room 9 ft. by 7 ft. by 6 ft. 6 in., sloping to 5 ft. at the side. Being just under the roof, the rooms are low pitched, and are hot in summer and cold in winter. They are in fair repair, but some wood-work running round the room is said to be infested with bugs, and the wooden partition which separates the front room from the back also forms a likely place for them. Each of the rooms opens straight off the little landing at the top of the staircase. To pass from one room to the other is to cross the top of the common stair. Privacy is impossible.

There is no place for storing food, or crockery, or knives and forks and the rest, except one wall cupboard in the front room. There is no scullery, no sink, or even water for washing up, no draining board or any place on which to handle clean things ; no water-closet nearer than at the foot of thirty-six stairs ; the w.c. is in the back-yard and is used in common by thirteen people in the house ; any stranger who comes into the house may foul it ; there is nothing to prevent anyone walking through to it from the street, for the front door of the house is always open ; no one person is responsible for its cleanliness. There is no slop sink or a sink of any kind nearer than the w.c. There is a washhouse ; it is in the basement below the level of the back-yard ; it is used on separate days by the various inmates of the house. The yard may serve

as a drying ground, but it is a long way off from the attic. There is no coal or wood store except the wall cupboard in the front room. There is no cold water tap nearer than in the back-yard or the basement. It was stated that as soon as the tenement was occupied water was to be laid on to a tap placed half-way between the first and second floors, with a small sink placed underneath it. There is a small cooking range but no hot water supply.

Shortly afterwards there came to live in this tenement a man and wife and four children, the six persons permitted by the by-laws to occupy its cubic space.

When the tenement is so occupied it is obvious that decency and privacy are impossible. Let anyone go through the small actions of daily life from the time of getting up in the morning to the time of going to bed, and consider how they could be done.

How is any personal washing to be done? Where is any bath to be put? Where can people dry themselves and dress? This attic is the housewife's workshop so to speak; how can she possibly manage it with any decency and success? Where can the man get any quiet for a chat or for reading, writing, or education? Where is time or place for devotions? How can children be educated at home or by their parents? Complaints are made that parents shirk their parental responsibility. It is this kind of home life that compels them to throw their responsibilities on to school and local authorities, or leave the children ignorant or ill.

Most noticeable is the absence of play room for the children. There is nowhere for them to play. They are cooped up at the top of the house, far even from the street; there is not so much as a passage to run up and down; there is no back-yard worth the name, and no front-yard or court. They must be either in the street or indoors. In this short street there are about 250 children of school age. It is very difficult to keep them clean. There is no mat for dirty feet and no lobby or other place for them to take off their dirty things. They must bring dirt indoors.

Added to other depressing circumstances is the general want of colour and relief in the surroundings. The dinginess and monotony of such houses and streets contribute materially to depressing the health of those who live in them.

Let anyone who is fairly well off and robust and well educated attempt housekeeping in these conditions; it is a great strain and a wearing struggle to be clean and decent. But for those who are ill-paid,

ill-fed, and fagged out, the obstacles to decent living are too great, and the struggle is too unequal. In this case the man was paying 5s. a week for rent—i.e., £13 a year. Suppose him to have been earning 25s. a week, and that for every week in the year. As a yearly statement it is: Income, £65; rent, £13; leaving £52. Required to feed, warm, and clothe two adults and four children on £52. To attempt to keep six people in proper health in London on 20s. a week is too huge a task. It cannot be done.

The problem for the breadwinner is the same as for any other business man. If he is not paying his way he must increase his income or reduce his expenses, or do both. Persons so placed may make some effort, and wear out body and soul in the process, or they may just sit down, as it were, and give it up; the task is too hopeless, too impossible for any human being. They lose heart, they lose hope, they lose self-respect. It is an oft-told tale, but none the less true. They become bankrupt both in money and in self-respect. That is one of the principal causes of the insanitary conditions found in houses let in lodgings.

We pass now to another house in the same street. Though the weather was fine and dry, the stairs and passages were filthily dirty; the sides of the passages were greasy, brown, and black, and although the front and back doors were open, and air was passing through freely, the house stank. The back-yard, reached by going down a few steps, was untidy, but not specially dirty, the weather being dry. Noticeable in one part, and covering about a quarter of the area of the yard, was a singularly abundant collection of what appeared to be cats' dung.

The exterior of the house, looked at from the back-yard, was not seen to be deficient in structural repair; the pointing of the brickwork, for instance, was complete, and the tiles were in place. One window was broken; nearly all were wide open; the glass surfaces were very dirty. One window space was shut and looked like a piece of grimy slate; its surface was quite dull and clotted over with black grime and lumps of soot. Nothing could be seen through it from the outside. It was, as a matter of fact, a staircase window, the surface of which was so fouled that, when seen from within, nothing but some brownish light came through. Being on the staircase, it was no one's business to open it or to keep it clean. Again, what was most noticeable about the premises was the deplorable want of accommodation for the children, who were pale and pasty-faced and undersized, and had no room whatever for exercise.

As one stands in the back-yard and looks up to the ground floor landing there appears from upstairs the miserable figure of a little girl about 3 years old, with a pale face and pasty complexion, with hair unkempt, and dirty, untidy clothes, with one leg bare and dirty and the stocking down at heel. She talks very indistinctly, and in a harsh and husky voice, repeating at intervals some queer word which she means for "landlord." She climbs slowly up the stairs, one by one, to the top tenement. This is similar in design and shape to the tenement last described, except that, in the front room, instead of a kitchen range there is an open coal fireplace; in the back room there is no fireplace; the total accommodation of the "home" is represented by one cupboard let into the wall between the window and the fireplace.

The tenement is occupied by husband and wife and two little girls aged 3 and 1.

It is necessary to hear and see how the details of the living arrangements were contrived. Where were coals kept? On the cupboard floor; at the moment there was only a little coal-dust. The kitchen was represented by a gas-stove outside the door, at the top of the stairs on the minute landing, where there was room for one person to stand. The scullery was represented in various ways; for instance, saucepans were kept on the cupboard floor with the coal-dust; on the lowest shelf of the same cupboard were some frying-pans, and on the shelf above that were some other pans and pots; washing-up was done in a bowl or pan on the solitary table in the middle of the room; there was no slop-sink nearer than the yard outside, thirty-five steps below.

As to pantry accommodation: A small quantity of crockery (very clean) was neatly piled together on a table in the middle of the room; there was a spirit stove and teapot on the top shelf of the cupboard. The larder was represented by the top shelf but one of the cupboard; on it was a small quantity of food. There was no place to dispose of urine or vomit nearer than the one w.c. in the back-yard, used in common by all the other persons in the house.

Washing of clothes (which lay in a heap on the front room floor) was done in a little room in the basement washhouse; this was used in turn by the various people in the house who required it. The clothes were hung up to dry on a line stretched across the front room and there was another line stretched across the top of the stairs just outside the door. In a pan on the gas stove were two pinafores that were being specially washed and prepared for the babies for a special occasion. In the midst of overwhelming difficulties the housewife was making

a good attempt at order and cleanliness; the floor was being scrubbed and was clean, there was a wooden chair which was clean, and the cups and saucers were clean and neatly arranged. On the back room window was a window box with a plant in it.

At a second visit the mother in this tenement was also found washing and scrubbing in the midst of her misery, only this time she hardly appeared to know what she was doing, for they were leaving the rooms and could not pay the rent, and she was expecting the landlord every minute to come in and take the few pieces of furniture instead. The scene was pitiful in the extreme.

No doubt the examples given are worse than some, but, on the other hand, they are not so bad as others. For instance, the 1911 Census revealed in London 138,226 tenements each of one room. The population housed in them was 265,553; and of this quarter of a million persons 100,948 were children under 10 years of age. Nothing could be more eloquent than that.

These conditions are not confined to certain parts of London; they exist in every district. Even in the City, with its small number of separate private families, namely 3,764, there are 489 one-roomed tenements with a population of 843 persons, 218 of whom are children aged under 10. Exclusive of the City, there is no one of the twenty-eight districts which has fewer than 1,000 one-roomed tenements. Islington, the largest district, contains 14,181 one-roomed tenements.

What was the condition in 1911 as to overcrowding in the 138,226 one-roomed tenements? 32,351 of them each contained more than two persons, the total population overcrowded in this way being 116,552. Included in this last figure were 41,833 children aged under 10.

It is not, of course, to be supposed that half London lives in tenements such as those which have been described in detail here. Some of them are passable, others in good order. Nevertheless, it is the case that half London lives in habitations which transgress one of the fundamentals of proper housing—namely, that a dwelling should be constructed to meet the habits of the occupants. Looked at as a whole, the extent and character of the tenement system in London is seen to constitute a gigantic tax on the public health.

No doubt it will be said that it is a counsel of despair to leave the conditions which have been demonstrated without indicating any remedial treatment. The reply is that it is not possible, within the limits of this paper, to discuss fully either the causes of or the remedies for the conditions which have been described. But there is one

remedial method which it is appropriate to mention, namely, that of the late Miss Octavia Hill. It is of special interest to us, because it was devised by a granddaughter of one of the most honoured of the founders of our original Society—I mean, of course, Dr. Southwood Smith.

The following extracts, the sequence of which is somewhat rearranged for clearness' sake, are taken from papers by Miss Hill, which were published together under the title of "Homes of the London Poor." But for Mr. Ruskin, she says, who alone believed the scheme could be worked, her undertaking might have remained a mere vision of what she would like to have done. He gave £3,000 and enabled a beginning to be made. This was in the year 1864. The money was all repaid.

Miss Hill found that the influence of the majority of the lower class of people who sublet to the poor was almost wholly injurious. "That tenants should be given up to the dominion of those whose word is given and broken almost as a matter of course, whose habits and standards are very low, whose passions are violent, who have neither large hope nor clear sight, nor even sympathy, is very sad. It seems to me that a greater power is in the hands of the landlords and landladies than of school teachers—power either of life and death, physical and spiritual. It is not an unimportant question who shall wield it. Take this as an example of entirely careless rule. The owner of some cottage property in London, a small undertaker by trade, said very straightforwardly, 'Yes, Miss, of course there are plenty of bad debts. It's not the rent I look to, but the deaths I get out of the houses!' His entire thought was of his profits, these dependent souls and bodies were to him as nothing. Consider under such a rule what deadly quarrels spring up and deepen and widen between families compelled to live very near one another, to use many things in common, whose uneducated minds brood over and over the same slight offences, when there is no one either compulsorily to separate them or to say some soothing word of reconciliation before the quarrel grows too serious.

"Two years ago (that refers to the year 1864) I first had an opportunity of carrying out the plan I have long contemplated, that of obtaining possession of houses to be let in weekly tenements to the poor. That the spiritual elevation of a large class depended to a considerable extent on sanitary reform was, I considered, proved; but I was equally certain that the sanitary improvement itself depended upon educational work among grown-up people; that they must be urged to

rouse themselves from the lethargy and indolent habits into which they have fallen, and freed from all that hinders them from doing so.

"I desired to be in a condition to free a few poor people from the tyranny and influence of a low class of landlords and landladies; from the corrupting effect of continual forced communication with very degraded fellow-lodgers; from the heavy incubus of accumulated dirt; that so the never-dying hope which I find characteristic of the poor might have leave to spring, and with it such energy as might help them to help themselves. I had not great ideas of what must be done for them, my strongest endeavours were to be used to raise habits of industry and effort, without which they must finally sink, with which they might render themselves independent of me, except as a friend and leader. The plan was one which depended on just governing more than on helping. The first point was to secure such power as would enable me to insist on more essential sanitary arrangements.

"Mr. Ruskin came forward with all the money necessary. I purchased three houses in my own immediate neighbourhood. It should be observed that well-built houses were chosen, but they were in a dreadful state of dirt and neglect. The place swarmed with vermin, the paper, black with dirt, hung in long strips from the walls; the drains were stopped, the water supply out of order. All these things were put in order, but no new appliances of any kind were added, as we had determined that our tenants should wait for these until they had proved themselves capable of taking care of them.

"A man wouldn't send his children to school. Dirty, neglected, and unhappy, they destroyed many things in the house. I urged, but to no purpose, that they should be sent. At last I gave him notice to leave because he refused to send them, and because he had taken three children to sleep in the room I had let for his own family only. The man was both angry and obstinate. I quietly went on with proceedings for getting rid of him. He knew I meant what I said, and he requested an interview. He owed no rent, he urged. 'No,' I replied, 'you know what a point I make of that; but it isn't quite the only thing I insist on. I cannot allow anything so wrong as this neglect of the children and overcrowding to continue where I have the power to prevent it.' The room was his; he took it, and if he paid the rent he could do as he liked with it. 'Very well,' I said, 'and the house is mine; I take it, and I must do what I think right in it, and I say that most landladies won't take in children at all, and we all know it is a good deal of loss and trouble; but I will risk these gladly if you will

do what you can to teach the children to be good and careful and industrious; and if not, you know the rule, and you must go. If you prefer liberty and dirt and mess, take them; but if you choose to agree to live under as good a rule as I can make it, you can stay. You have your choice.' Well, he'd 'not do anything contrairy, without telling me, about lodgers; and as to the children, he thought he could turn himself, and send them a bit, now his work was better.'"

In another paper Miss Hill wrote: "About four years ago I was put in possession of three houses in one of the worst courts in Marylebone. Six other houses were bought subsequently. All were crowded with inmates. The first thing to be done was to put them into decent tenantable order. The set last purchased was a row of cottages facing a bit of desolate ground occupied with wretched, dilapidated cowsheds, manure heaps, old timber, and rubbish of every description. The houses were in a most deplorable condition—the plaster was dropping from the walls; on one staircase a pail was placed to catch the rain that fell through the roof. All the staircases were perfectly dark; the banisters were gone, having been burnt as firewood by the tenants. The grates, with large holes in them, were falling forward into the rooms. The washhouse, full of lumber belonging to the landlord, was locked up; thus the inhabitants had to wash clothes, as well as to cook, eat and sleep in their small rooms. The dustbin, standing in the front of the houses, was accessible to the whole neighbourhood, and boys often dragged from it quantities of unseemly objects and spread them over the court. The state of the drainage was in keeping with everything else. The pavement of the back-yard was all broken up, and great puddles stood in it, so that the damp crept up the outer walls. One large but dirty water-butt received the water laid on for the houses; it leaked, and for such as did not fill their jugs when the water came in, or who had no jugs to fill, there was no water."

In another paper Miss Hill writes of some other houses thus: "It was near the end of 1869 that I first heard that a good many houses in a court near my own house were to be disposed of. Eventually, in the course of that year, six ten-roomed houses were bought by the Countess of Ducie, and five more by another lady, and placed partially under my care. I was especially glad to obtain some influence here, as I knew this place to be one of the worst in Marylebone; its inhabitants were mainly costermongers and small hawkers, and were almost the poorest class of those among our population who had any settled home, the next grade below them being vagrants who sleep in common

lodging-houses; and I knew that its moral standing was equally low. Its reputation had long been familiar to me, for when unruly and hopeless tenants were sent away from other houses in the district, I had often heard that they had gone to this court, the tone in which it was said implying that they had now sunk into the lowest depths of degradation.

"If anyone had entered these houses with me two years ago he would have seen enough to surprise and horrify him. In many of the houses the dustbins were utterly unapproachable, and cabbage leaves, stale fish, and every sort of dirt were lying in the passages and on the stairs. In some the back kitchen had been used as a dustbin, but had not been emptied for years, and the dirt filtered through the front kitchens, which were the sole living and sleeping rooms of some families. In some the kitchen stairs were many inches thick with dirt, which was so hardened that a shovel had to be used to get it off. In some there was hardly any water to be had; the wood was eaten and broken away; windows were smashed and the rain was coming through the roofs. At night it was still worse; and during the first winter I had to collect the rents chiefly then, as the inhabitants being principally costermongers were out nearly all day, and they were afraid to trust their rent to their neighbours. It was then that I saw the houses in their most dreadful aspect. I well remember wet, foggy Monday nights, when I turned down the dingy court, past the brilliantly lighted public-house at the corner, past the old furniture outside the shops, and dived into the dark, yawning passage-ways. The front doors stood open day and night, and as I felt my way down kitchen stairs, broken and rounded by the hardened mud upon them, the foul smells which the heavy foggy air would not allow to rise met me as I descended, and the plaster rattled down with a hollow sound as I groped along.

"It was truly appalling to think that there were human beings who lived habitually in such an atmosphere, with such surroundings. Sometimes I had to open the kitchen door myself, after knocking several times in vain, when a woman, quite drunk, would be lying on the floor on some black mass, which served as a bed. Sometimes, in answer to my knocks, a half-drunken man would swear, and thrust the rent money out to me through a chink of the door, placing his foot against it, so as to prevent it from opening wide enough to admit me. Always it would be shut again without a light being offered to guide me up the pitch-dark stairs. Such was the court in the winter of 1869. Truly a wild, lawless, desolate little kingdom to come to rule over."

Further light is thrown upon Miss Hill's methods by the following

passage: "Two distinct kinds of work depend entirely on one another if they are to bear their full fruit. There is, firstly, the simple fulfilment of a landlady's bounden duties, and uniform demand of the fulfilment of those of the tenants. We have felt ourselves bound by laws which must be obeyed, however hard obedience might be. Then, secondly, there is the individual friendship which has grown up from intimate knowledge, and from a sense of dependence and protection. Such knowledge gives power to see the real position of families; to suggest in time the inevitable result of certain habits; to urge such measures as shall procure the education of the children and their establishment in life; to keep alive the germs of energy; to waken the gentler thought; to refuse resolutely to give any help but such as rouses self-help; to cherish the smallest lingering gleam of self-respect; and, finally, to be near with strong help should the hour of trial fall suddenly and heavily, and to give it with the hand and heart of a real old friend, who has filled many relations besides that of our almsgiver, who has long ago given far more than material help, and has thus earned the right to give this lesser help even to the most independent spirits."

From these extracts it will be seen that the success of Miss Hill and of the women workers whom she trained as her assistants has been due, amongst other things, to the elimination of intermediaries and the directness of business relations between landlord and tenant; to the personal and friendly intercourse between landlord and tenant; to the observance of justice towards the tenants instead of harshness, on the one hand, or charity on the other; to the cultivation of the principle of self-help; and to the employment of women in the work.

Miss Hill has demonstrated that success in dealing with the problem under consideration is in proportion to the observance of these conditions. Especially are we indebted to her for emphasizing the fact that remedial efforts, to be successful, must be directed to strengthening the people in every possible way, so that they may come to be able themselves to throw off the difficulties and misery by which at present they are surrounded.

DISCUSSION.

Dr. HAMER said that Dr. Wanklyn's paper gave a realistic description of the conditions of life in mean streets and recalled to their minds such papers as that read some years ago by Dr. Arnold Evans on "Back-to-back Houses," or Dr. Chalmers's paper of last session on "The House as a Contributory Factor to the Death-rate." In recent years there had been manifested in

certain quarters a disposition to insist, perhaps unduly, upon the influence of Nature as opposed to that of nurture ; the high death-rates in back-to-back houses were held to be almost entirely attributable to the fact that the occupants of such houses were the descendants of parents who were unhealthy and who had bad habits, and the high rates in one-apartment houses in Glasgow would be explained by some high statistical authorities in a similar manner. No doubt members of the Section who had knowledge of the actual facts, when they listened to the arguments of biometricians and eugenicists would entertain their own mental reservations, and, like Galileo before the Inquisition, would mutter their own expression of dissent. Whatever the statistician might have to say, the fact remained that man was influenced by his environment, and the value of a paper like Dr. Wanklyn's was that it brought them down from the clouds and set them face to face with facts.

Dr. BUCHANAN also welcomed an occasional paper on environmental conditions of the population, and in particular a paper which showed how much need there still is for active measures to improve environmental hygiene in this country. There were conditions in London, not mentioned in the paper, which from the health point of view should be put in the opposite scale to those which Dr. Wanklyn mentioned ; open spaces, paving, and many other things in which London had advantages in comparison with other cities. Possibly the paper might be criticized as giving extreme rather than normal circumstances of the London working-class population. Be that as it might, the conditions of life in an enormous number of these "let down" houses was deplorable and required remedy. The admirable method pursued by Miss Octavia Hill was based on individualist conceptions out of fashion at the present day, and he thought any considerable development on such lines was unlikely, though very desirable. It seemed a question for local government. London medical officers of health who were present could say what could be done, but his own impression was that powers already existed to deal with "houses let in lodgings" which had only to be exercised in the streets to which Dr. Wanklyn referred to effect a substantial improvement. The supply of water above the basement floor and the cleansing of common stairs and windows were matters in point. If the powers were incomplete or insufficient better and stronger powers should be sought by legislation. There were, of course, much wider issues ; large social and political questions were at the root of it, but this was no reason why the local authorities of London should not do their part in their own areas with the information they now had from their health visitors and sanitary staff with the work ready to their hands.

Dr. WHEATON said that all these houses let in lodgings should be registered, regularly inspected, and by-laws made for their regulation, and these should be duly enforced. The powers of many London Borough Councils for regulating these houses were less than those of places in the provinces, and at least one London Borough had no by-laws for this purpose at all. The amount of inspection and the extent to which by-laws were enforced also varied greatly in different parts of the Metropolis. In Nottingham, for instance, the Town

Council's by-laws were much in advance of those of some London boroughs, and some towns had special powers to deal with them under local Acts. No doubt there was much to be said in favour of the need for legislation to give increased powers, especially in the case of "furnished rooms," which had not been described or mentioned by Dr. Wanklyn, and the conditions of which were often extremely unsatisfactory and much worse than those of any unfurnished lodgings. But it was of little use giving increased powers if those already possessed were not enforced. He thought that ample by-laws, with sufficient and regular inspection, together with visits from health visitors, would do much to improve the sanitary condition of these places and thus indirectly improve the moral and social condition of their occupants.

Dr. DUDFIELD began by observing that in Paddington at least the Council had all, and more than, the powers which Dr. Wheaton thought a local authority should possess for the regulation of tenement houses. The subject of the paper involved questions of social economy which could not be discussed on that occasion, as well as principles relating to the duties and liabilities of landlords and tenants. As regards the former, there was little doubt that, with some notable exceptions, the poorer landlords were the worst. It was almost a disaster when houses were purchased out of savings and became, in the old age of the purchaser, a kind of old age pension. In such cases the property was squeezed to the utmost, and no money could be taken for the maintenance of the houses. He thought there had been in the past a somewhat undue tendency to hold the landlord solely responsible for the condition of tenement houses—to pass over the duties of the tenants. For that reason he had advised his Council to obtain additional powers in the by-laws relating to tenement houses whereby the tenants themselves were made responsible for matters which constituted domestic economy and hygiene. It was his desire not to put the new powers into force at once, but to allow some time to elapse in which it was hoped to educate the tenants to a sense of their responsibility. It was impossible to dragoon the people to be clean or maintain decent home conditions. They required to be educated to that end. Such considerations naturally led to a question of the altered conditions of the early lives of girls. Not so long ago young girls spent much of their time in their homes, learning something of home care and child rearing. Most of them as young adults went into domestic service where they learned more. Nowadays the young girls were compelled to go to school, and after leaving school the majority took up work away from home, with the result that they began wedded life and motherhood knowing next to nothing of their duties. There was an urgent need of radical changes in school teaching, which at present was far more of the nature of instruction rather than education. Adverting, again, to the question of the powers of local authorities, it should be remembered that officials frequently encountered serious hindrances, both through the timidity or self-interest of the members of the authorities, and through the too frequent leniency of magistrates who refused to inflict penalties sufficient to impress delinquents with a real sense of their responsi-

bilities. Dr. Wanklyn had referred to the work of the late Miss Octavia Hill. He (the speaker) was glad to say that there was in Paddington an association which was carrying on much of Miss Hill's work—buying houses and managing them. As a last observation he wished to refer to a change in housing conditions which he had noticed in connexion with the inquiry on housing and wages recently carried out by the Board of Trade. Comparing data collected for the Board in 1906 and 1912 he had found that in the majority of the "sample streets" there had been notable reductions in the proportions of tenements of one and two rooms, while in some the four-room tenement had disappeared. The people in the selected streets now tended to occupy tenements of three rooms, although, as appeared from the latest census reports, the families were on an average smaller. The average rent paid for all classes of tenements was sixpence less in 1912 than in 1906. In selecting the streets for the inquiry every endeavour was made to choose typical "working-class" property.

Dr. J. E. SANDILANDS said that he admitted the accuracy of Dr. Wanklyn's description of the conditions in houses let in lodgings to the working classes, and that such conditions were inexcusable, but in doing so he would like to call attention to some of the difficulties which attended the use of the existing by-laws for the purpose of effecting permanent improvement. Experience had shown that the law requiring water to be supplied on one of the floors occupied by each family could be enforced, but although the labour of carrying up water had thus been done away with, all the water used for domestic purposes had still to be carried down, since owners were not required to provide slop sinks. They were required to provide two water-closets if the number of lodgers in a house exceeded twelve, but to save expense the second closet, instead of being erected on the first floor, where it could serve as a slop sink, was invariably placed next the other closet in the yard, or, failing this, lodgers were evicted until their numbers were reduced below twelve. The two underlying principles in the scheme of the by-laws were: (1) That the lodger should only be responsible for the state of the rooms over which he had an undivided control; and (2) that the landlord should be responsible for the state of passages, staircases, closets, and everything in the house which the lodgers used in common. In addition the landlord or owner was required to cleanse, and re-paper if necessary, all the rooms in his house once a year, and to prevent overcrowding. Finally, it was provided that in the case of the landlord, breach of by-law should not be in itself an offence, and that no offence should be deemed to have been committed by a landlord until he had failed to comply with the by-laws after notice from the sanitary authority. A landlord, especially if he did not reside in his house, was probably entitled to this measure of protection, but whether this were so or not, the necessity of giving notice robbed the by-laws of half their value. It left the landlord without a sanitary conscience to be quickened in case of need by the law and transferred the whole of his duty of weekly or even daily supervision to the sanitary authority. The 2,000 registered houses in Kensington could not be inspected weekly. The inspectors could not pay

100,000 visits in a year to this class of property, and the clerks could not make out 100,000 notices for dirty common staircase windows and common water-closets. The fact of dirty conditions should be the offence, and not, as at present, the failure to cleanse after notice. The landlord who knowingly let a room of 900 cubic feet to a family of seven persons was guilty of no offence. He received the rent for perhaps ten or twelve weeks before the inspector made his visit, and then all he had to do was to turn the lodgers out. At the end of a few weeks he could again let the same room to the same number of lodgers, and so he could continue with impunity to overcrowd his rooms for an unlimited period of time provided he was careful to comply with the requirements of the notices of the sanitary authority when they had been served. And so with the stripping, cleansing and re-papering of rooms. The landlord was not required to take an interest in his property and keep it in a cleanly state. On the contrary, if the by-law might be paraphrased, he was required to abstain from all cleansing on his own initiative, and to wait for the day on which he received an order to cleanse from the sanitary inspector. By-laws which can only produce cleanliness by the weekly inspection of houses let in lodgings must either be regarded as waste paper or lead to enormous expenditure in the appointment of inspectors to take over the weekly duties of landlords. The most hopeful solution appeared to lie in the suggestion that houses let in lodgings should be licensed annually. Under this scheme, if the common passages, staircase windows, closets, &c., were found in a dirty state say, half-a-dozen times in the year, the licence would be withdrawn and the house would be closed as a lodging-house. Should licensing prove to be impracticable, it was to be feared that these houses would continue in their present condition.

Mr. KEITH D. YOUNG said that the question was one that bristled with difficulties and anomalies; for example, side by side with overcrowding in some localities, we had a considerable amount of empty houses in others. Another and more serious difficulty was the question of rent in relation to wages. Some years ago the Mansion House Council on Dwellings of the Poor instituted an inquiry into the housing conditions in London, and the report, which was drawn up by the late Mr. Craies and Dr. Hogarth (now Medical Officer of Health for Buckinghamshire), while it did not profess to prescribe a remedy, made certain practical suggestions which seemed to him of value. One of these was the great utility of the personal element as carried out under Miss Octavia Hill's method of work. Another, and he thought a very sound suggestion, was that "made down" houses which had become converted from single family dwellings into tenement houses might, without excessive outlay, be so altered as to become really healthy, convenient, separate dwellings for family life. Where this could be economically done, it was far better than building block-dwellings. The want of playground space for the children, referred to by Dr. Wanklyn, was a very real evil. Notwithstanding the very large area of open space in London, there were many parts where the children had nowhere to play but the streets.

Mr. F. E. FREMANTLE said that a paper such as Dr. Wanklyn's made country bumpkins thank heaven that London was not England, and that their duties lay outside the fetid air of the cities in the purer, simpler, and more natural atmosphere of the countryside. This paper was a worthy result of the expansion of this Section from one of statistics and precise statement to one which embraced the field of administration, including problems which required to be stated in terms that were no less accurate and truly scientific, but appealed as a picture to the imagination as well as to the intellect. And a heartrending picture it was to the man of science as well as to the humanitarian. Such was the extreme product of civilization—the result of industrial developments—which had led to this awful congestion of life, and disturbance of natural conditions and natural instincts. The fetish of material efficiency lay at the root alike of the fiscal policy of the Victorian Age and of that frenzied competition which was responsible for the social misery of the London slum. What, then, were the remedies? It was necessary to insist on the paramount importance of the personal factor. A healthy-minded, intelligent, and determined person could live healthily even in a slum. A careless, ignorant, feeble-spirited person would make a slum out of a palace. It was the personality of the tenant that supplied the inner key, at any rate, of the problem. It was this factor which Miss Octavia Hill attacked, and if Dr. Dudfield's instance of similar activity in Paddington were, as Dr. Buchanan said, a relic of the past, we must lay all stress on the new version of the same principle—the system of health visiting and the sanitary influence of district nurses. In the present century public health had undergone a revolution. We had cast off much of our old work on to sanitary engineers and inspectors. While keeping our eye on the drains, wells, and water-pipes, we turned our attention to the personal factor, and sought to educate both householder and child—in theory and in practice, in general and in detail, in "health week," in schools and in daily life, in the essentials of body culture and home craft. But the material conditions also required attention, and the remedies usually proposed did not touch the kernel of the matter. We could not insist, as had been suggested in this discussion, on the general raising of wages, or lowering of rents, or expropriation of owners' rights, for the inevitable result of the first was to throw the less able out of employment; while all these suggestions violated the right of private possession, a cherished axiom of British citizenship. The only true solution of the problem of the slum lay in the Garden City scheme. Its essence was the migration of the factory to, or the plantation of new factories in, the country or the outskirts of county towns, where land could be bought at low cost and laid out on healthy lines from the outset—for the factories in which men and women worked all day, for the open spaces, small holdings and gardens in which they spent their leisure hours, for the shops and markets in which they bought, and for the homes in which they ate and slept. This migration of the factory was an accomplished fact, not only in Letchworth, but in a wide ring all round our great cities. It occurred daily even now. It hit the root of the problem.

as no garden suburbs or city improvements could ever do. And although municipal authorities could never be expected to encourage such emigration from their midst and its consequent reduction of rateable value, it would be a legitimate sphere of enterprise for the State to step in and do all it could to promote, on terms fair to all, such a spreading of factory life over the country under conditions in which the possibility of slum growth for all future time might be securely prevented.

Dr. SHRUBSALL pointed out that while much remained to be done for the housing of the poorer classes the conditions had much improved, and facilities were now available in houses let in lodgings which were not possessed by the palaces of the nobility two or three centuries ago. These changes were reflected in public health and the mortality-rates, though the relation of the fall in the death-rate appeared to be most closely correlated to the reduction in the cost of foodstuffs. Very rapid changes could not be expected. When experiments were made in changing the habits of organisms the period required was measured by generations and not in terms of parts of a single lifetime. Why should it not be the same with man? Those who wished for constant changes because they did not see immediate results were like those who would dig up a plant to see if it were growing.

Dr. WANKLYN, in reply, said he did not agree at all with Dr. Buchanan in thinking that Miss Hill's work was out of date. It might be that it would not be carried out in the same individualistic manner in which it had been begun, but he thought the principles of her work might be carried out in future by associations of persons. He was confirmed in this view by what had fallen from Dr. Dudfield about an association of that kind which was working in Paddington; and also by the fact that a similar association was working in another district of London; the latter association being concerned in buying up houses owned by poor persons, who no doubt were likely to be the worst landlords; such houses could be bought quite cheap. He was absolutely convinced that success would not attend attempts to deal with this aspect of housing, unless the conditions, which Miss Hill had demonstrated as necessary, were observed. As regards the ultimate solution of this very difficult problem, Dr. Wanklyn agreed with Dr. Fremantle that it was only to be found in dealing with the factories. He instanced what might sometimes be seen in country districts: A little factory, with its chimney and buildings, forming the nucleus of a group, the outer fringe of which was composed of a compact collection of mean cottages. That was a type, and was reproduced *ad infinitum* in London and other places. In a simple example, like the one quoted, no one would think of dealing with insanitation in the cottages and giving no consideration to the factory. The problem of the tenements was not an isolated matter, but only one end of a tangled string, one of the other ends of which was in the factory; and unquestionably part of the solution, at any rate, was in means being found to include proper accommodation for factory hands, that is, for staff, in the sanitary minimum which was required of the factory.

Section of Epidemiology and State Medicine.

November 28, 1913.

Dr. W. H. HAMER, President of the Section, in the Chair.

The Mortality from Phthisis: A Statistical Investigation having bearing upon the Question of Personal Communicability.

By E. C. SNOW, M.A., D.Sc.

(1) THE topical importance of all matters having reference to the incidence of phthisis upon a human population, and the fact that the statistical methods of analysis developed in the past few years have so far only skimmed the immense storehouse of medical data extant, are the reasons why, in response to the invitation to read a paper before the Epidemiological Section of the Royal Society of Medicine, I have selected the subject indicated by the above title. I am fully conscious of the difficulties a layman labours under in dealing with such a problem. The medical man who is untrained in statistical methods may, when analysing his data, very easily fall into one or more of the technical pitfalls which are always at hand—like bunkers on a golf course—and which even the best trained and most experienced in the handling of figures could not afford to ignore. But the statistician who essays to deal with medical data, while not immune from fallacy, suffers from the disadvantage that he is frequently not conversant with the terminology employed or the real nature of the matter he discusses, and that he must obtain his information at second hand from books. Explanations which may readily suggest themselves to a medical reader fall outside the range of a layman's experience. Nevertheless, the arithmetical work involved in statistical dissection is sufficiently extensive to render it impossible for medical men themselves to perform complete analysis of the material they collect; and the statistician can at least perform

that analysis, and put certain conclusions forward for discussion and criticism. The present paper has been written from this point of view. It describes no new discovery which—like that of the tubercle bacillus—can actually be perceived by all who wish, but aims only at being suggestive. Before the suggestions pass into the realm of substantiated facts, or into the lumber room of misconceived notions, much more work and criticism are required.

(2) Whatever may have been the fluctuations of beliefs and suppositions in the past, nobody competent to express an opinion at the present day appears to doubt the possibility of personal infection in the case of phthisis. At the same time, few acquainted with the immense advances made of recent years in the study of the hereditary transmission of many physical and mental characters would be prepared to deny positively that susceptibility to, and possible immunity from, the tubercle bacillus vary according to hereditary disposition, even without the direct evidence of Pearson and others bearing upon the subject. In this paper, however, no light whatever is thrown upon the vexed question of the relative importance of soil and germ. All it attempts to do is to dissect certain evidence which might be expected to give information upon the communicability of the disease from one human population to another. Many extraneous influences affect the value of this evidence, and these must be weighed in a more thorough manner than is possible here before the conclusions suggested can pass from the region of mere hypotheses. The method of investigation is such that illumination might be anticipated upon the more detailed questions: (a) How does personal communicability of phthisis vary with age? (b) Does it vary with sex? These, again, require to be discussed from two points of view—first, that of power to infect; and second, that of susceptibility to infection. Do the populations of certain age-groups more readily communicate the disease than do others, and is it more readily communicated to them? Does one sex more easily impart or receive infection than the other? Such questions must by their nature ultimately be solved by statistical methods, and the process used in the present investigation is suggestive of a method by which the final answer can be reached.

(3) The description of that process is as follows: Divide the rural portion of the community up into approximately equal areas and consider the populations living upon these areas at a certain time. In this

paper I have confined myself to ages between 15 and 45. Let M_1 , M_2 , M_3 , M_4 , and F_1 , F_2 , F_3 , F_4 , denote the numbers of males and females, respectively, living in the sub-age-groups 15-20, 20-25, 25-35, 35-45 (these groups are selected to accord with the data used later on), and m_1 , m_2 , m_3 , m_4 , and f_1 , f_2 , f_3 , f_4 , the numbers in these populations suffering from phthisis. Assume that these populations are "ideal" populations which are the same as regards constitutional fitness, general health conditions, occupation, and the other factors—other than those concerned with infection—which may produce variation in the incidence of phthisis. Select for consideration only those districts in which M_1 —the number of males between 15 and 20—is the same, say, 1,000. The number of females in that age-group (F_1) will vary throughout the districts, say, for the sake of argument, from 500 to 1,500. An area in which the number of females approaches 1,500 will have on the average a larger absolute number of phthisical females (15-20) than one in which the number of females approximates to the lower limit. Let A and B, respectively, denote two such districts. Leaving out of consideration for the present the effect of the other age-groups, it will be clear that the 1,000 males (15-20) in A will come into contact on the average with more phthisical females than the 1,000 males in B. If the females can infect the males, therefore, we should expect to find m_1 —the number of males suffering from phthisis—larger on the average in A than in B.

In the same manner (still assuming our populations to be ideal as regards the factors—other than infection—affecting the incidence of phthisis) we might choose districts in which F_1 is the same throughout, and consider the variation in the number of phthisical females as the number of males changes from area to area. This would suggest whether or not the males communicate the malady to the females. Again, we might select areas in which M_1 —the number of males (15-20)—is the same, and consider the fluctuations in the number of phthisical among those males according to the variation in the number of males (M_2) in the 20-25 age-group. This might be expected to shed light upon the question of communicability from males to males. Similarly for females, and for other age-groups.

It is easy to criticize this notion and to point out difficulties in the way of interpreting the results which would be derived from applying this method to the statistics of such a disease as phthisis. It is merely intended as a skeleton hypothesis into which many details have to be filled—a working idea to be followed up and, if necessary, discarded in

favour of some other suggestion brought out by the work. Comments upon the effects of the other factors referred to may be held over until some actual data have been examined. It may be pointed out here, however, that the restriction of the equality of the superficial areas of the districts is unnecessary. A priori, we should expect this to be so, and as this view is supported by statistical evidence referred to later—section (11), footnotes—the restriction is dropped in the following paragraphs and districts chosen for inquiry without regard to their size.

(4) In order to follow out the idea suggested in the last section, we require figures referring to males and females separately. The only uniform and detailed data extending over a long period on the subject of phthisis in England and Wales are those of mortality in the Registrar-General's various Decennial Supplements. We can do nothing better at present than assume that the distribution of mortality from phthisis throughout a series of districts roughly accords with the corresponding distribution of those suffering from phthisis. The last three Decennial Supplements have not shown mortality of each sex in individual districts, and I have had recourse to that relating to 1861-70. The question of the trustworthiness of the data can best be considered after the investigation has been described, but it may be well to mention one or two points in this connexion at the present stage. No doubt the data relating to the period 1861-70 suffer from the fact that the diagnosis of phthisis in that era was defective, but at the same time they have certain advantages over figures relating to the present century. The tubercle bacillus was then unheard of, and sanatoria were unknown. Partial segregation of phthisical individuals into reputed health resorts might have occurred among the better classes, but to no extent at all among the masses, while general institutional segregation was considerably smaller than at the present time. In my opinion, taking all things into consideration, the figures shown in the Registrar-General's Decennial Supplement relating to 1861-70 give a more efficient picture of the *natural* distribution of phthisis among the rural districts dealt with in this paper than do the corresponding figures for 1891-1900. The difficulty that diagnosis was probably defective cannot be overlooked, but it carries less weight in the present investigation than in one in which it was required to determine the total extent of phthisis in the period under review.

As the Decennial Supplements deal with the mortality in ten-year periods, the various populations exposed to risk throughout the ten

years should be employed. The actual information given for 1861-70 is the arithmetical mean of the census populations at the beginning and end of the period. No error arises in the present connexion through taking the latter to represent the former. This is chiefly because of the grouping and use of a large working unit which are always possible in this type of investigation.

TABLE I.—1861-70. MALE MORTALITY FROM PHTHISIS IN A SAMPLE OF FORTY DISTRICTS IN WHICH THE NUMBER OF MALES (20-25) WAS APPROXIMATELY CONSTANT (483-525) AND THE NUMBER OF FEMALES (20-25) VARIED FROM 391 TO 895.

Registration district	Number of males (20-25)	Number of phthisis deaths, males (20-25)	Number of females (20-25)	Death-rate from phthisis, females (20-25)
Ongar	485	11	391	41
Bromyard	493	9	427	26
Pickering	519	8	455	24
East Ashford	489	17	463	52
Hailsham	511	19	464	63
Helmsley	503	18	474	45
Battle	505	12	478	52
Garstang	506	13	496	56
Alton	491	15	515	60
Freebridge Lynn	517	17	517	52
Linton	511	22	518	50
Brixworth	491	14	529	43
New Forest	491	2	529	64
Hoxne	494	27	535	54
Llanrwst	514	35	535	59
Market Bosworth	515	24	537	50
Loddon	487	22	538	76
Hollingbourne	514	18	543	18
Dorking	516	21	550	25
Smallburgh	500	26	561	75
Pershire	510	10	564	36
Swaffham	508	20	566	44
Woodstock	507	20	569	47
Wallingford	523	17	570	54
Malmsbury	515	17	581	38
Cookham	501	14	585	36
Buckingham	510	15	588	59
Warminster	509	23	589	48
Blandford	511	20	601	33
Tewkesbury	497	19	605	33
Conway	511	36	621	50
Solihull	515	14	625	24
Eastbourne	514	23	625	25
Blaby	505	21	638	38
Glendale	512	8	639	18
Witham	524	26	643	55
Berkhamsted	483	8	646	39
Poole	525	20	648	46
Christchurch	498	41	794	47
Cardigan	498	65	895	49

(5) A description of the preliminary work can now be given. Registration districts were selected in which the mean number of males (20-25) was between 450 and 550, and from these 40, in which

the number varied between the narrow limits 483 and 525, were picked out. These places were scattered all over England and Wales (*see* Table I, p. 25), but they included no portions of large urban districts. Considerable variation in the mortality from phthisis among these male cohorts was anticipated, and the districts were arranged to ascertain if those in which the male phthisis mortality was high were

Information	Ongar			Cardigan			
	1851-60	...	1861-70	1851-60	...	1861-70	
Number of males (20-25) ...	493	...	485	...	540	...	498
Deaths from phthisis 1861-70, males (20-25) ...	12	...	11	...	53	...	65
Number of females (20-25) ...	421	...	391	...	931	...	895
General death-rate (males) ...	18·3	...	18·0	...	21·2	...	20·3
General death-rate (females)...	18·0	...	18·4	...	18·1	..	18·2
Death-rate from causes other than phthisis (males) ...	17·3	...	16·4	...	17·1	...	16·6
Death-rate from causes other than phthisis (females) ..	16·6	...	16·7	...	15·0	...	15·5
Proportion of males over 20 (1871) in				Ongar	Cardigan		
<i>Professional class</i> ...	...	...	...	4·0	...	5·6	
(On defence) ...	...	...	...	(0·5)	...	(0·7)	
<i>Domestic class</i> ...	...	...	...	4·3	...	2·5	
<i>Commercial class</i> ...	...	...	...	2·2	...	10·4	
(In conveyance of men, animals, food, &c.)	...	...	...	(1·1)	...	(9·3)	
<i>Agricultural class</i> ...	...	...	...	67·3	...	42·9	
<i>Industrial class</i> ...	...	...	...	18·4	...	26·2	
(Art and mechanical productions)	...	...	...	(6·7)	...	(11·8)	
(Textile fabrics and dress)	...	...	...	(2·8)	...	(6·9)	
(Minerals) ...	...	...	...	(2·7)	...	(4·3)	
<i>Indefinite and non-productive class</i>	...	...	...	3·8	...	12·4	
(Rank and property) ...	...	...	...	(3·4)	...	(0·4)	
Proportion of females over 20 (1871) in							
Domestic class ...	...	...	...	87·1	...	76·2	
Agricultural class ...	...	..	...	3·9	...	10·9	
Textile fabrics and dress class ...	...	...	...	4·0	...	6·7	
Rank and property class ...	...	...	...	1·8	...	1·5	
Proportion relieved indoors to				Per cent.	Per cent.		
(a) Total relieved (mean 1861-70)...	...	...	...	12·7	..	3·3	
(b) Total population mean (1861-70)	...	...	...	1·0	...	0·3	

those in which the excess of females (20-25) was large. A cursory inspection of the figures in Table I shows that this is actually the case. The number of females varied from 391 to 895, and the phthisis mortality among the males, on the whole, increases as the number of females increases. The first suggestion on seeing the figures is that it so happens that in this sample the number of females is largest in districts in which from general causes the phthisis mortality is heavy; but this is not borne out by the column indicating the phthisis

mortality-rate of the females. Frequently, where the mortality of the females is low that of the males, in districts in which the females are numerous, is high. The differences between the figures for the extreme districts—Ongar and Cardigan—are sufficiently striking to be separately set forth, together with other information which might be expected to give some illumination on the cause of the differences.

With approximately the same number of males (20-25) in the two districts and with but little difference between the female mortality-rates the place with 900 females (20-25) had in 1861-70 six times as many male deaths from phthisis as that with 400. The figures of occupations, though certainly differing appreciably, do not readily suggest any complete explanation of the very large dissimilarity between the male mortalities. The rough indices of segregation certainly show a higher proportion of the population segregated in the locality of low mortality, but this is suggestive of a further inquiry rather than explanatory of the difference noted in mortality.

The statistical constants relating to the figures in Table I are:—

			Mean		Standard deviation
Deaths from phthisis (males)...	...	...	20·15	...	10·20
Number of females ...	...	..	568	...	90

Correlation between deaths from phthisis (males) and number of females 0·67

Average number of phthisis deaths (males) = 0·076 (number of females) — 23·0

On the average, throughout the forty districts, a district with 100 more females than another had between seven or eight more deaths among the males. A similar story is told by the table drawn up in the same way for the decade 1851-60. As no new points are suggested by it there is no need to print it. The forty districts dealt with so far are scattered over a large area throughout which very considerable variation in the amount of phthisis mortality existed, and this variation was due to many causes. At present I have merely shown an association to exist (on the strength of one sample) between an excess of females and mortality among the corresponding males. I make no suggestion of causal relationship between these phenomena.

(6) A similar process to that described in the last section shows the relationship between excess of males (20-25) and phthisis mortality of females (20-25) among districts with approximately the same number of females. Table II gives a sample of thirty-two registration districts in which the mean number of females (20-25) in 1861-70 varied

between the narrow limits of 550 and 597. The number of males (20-25) ranged from 436 to 646—a range much smaller than that noticed in the last section for the females. Inspection of the table does not produce the impression that the districts with the heaviest female phthisis mortality are those with the most males. The extreme

TABLE II.—1861-70. FEMALE MORTALITY FROM PHTHISIS IN A SAMPLE OF THIRTY-TWO DISTRICTS IN WHICH THE NUMBER OF FEMALES (20-25) WAS APPROXIMATELY CONSTANT (550-597) AND THE NUMBER OF MALES (20-25) VARIED FROM 436 TO 646.

Registration district	Number of females (20-25)	Number of phthisis deaths, females (20-25)	Number of males (20-25)	Death-rate from phthisis, males (20-25)
Shaftesbury	554	25	436	34
Lutterworth	576	25	449	36
Bingham	582	36	449	51
Shifnal	552	14	462	39
Beaminster	570	25	472	36
Dolgelly... ..	553	28	476	77
Richmond (Yorks)	586	30	496	40
Smallburgh	561	42	500	52
Cookham	585	21	501	28
Woodstock	569	27	507	39
Swaffham	566	25	508	39
Warminster	589	28	509	45
Pershore	564	20	510	20
Buckingham	588	35	510	29
Malmsbury	581	22	515	33
Dorking	550	14	516	40
Wallington	570	31	523	33
Thame	567	43	535	30
Bosmere... ..	580	34	537	41
Machynlleth	565	33	538	69
Ellesmere	589	24	543	46
Westhampnett	552	36	544	50
Bicester	584	28	545	36
Howden	596	45	546	47
Cranbrook	563	27	548	38
Thrapston	581	24	553	36
Leominster	597	19	564	43
Bradfield	596	29	581	33
Ledbury... ..	552	14	591	20
Faringdon	594	30	615	39
Ruthin	594	34	619	57
East Grinstead	568	25	646	28

districts—East Grinstead and Shaftesbury—have the same female phthisis mortality, although the former had more than 200 more males (20-25) than the latter. The statistical constants for this sample are :—

	Mean	Standard deviation
Deaths from phthisis (females)	27·91	7·70
Number of males	527	49
Correlation between deaths from phthisis (females) and number of males		0·07

The correlation in this case is practically zero compared with 0.67 for the first sample. The difference is striking. The male mortality from phthisis is highest (at any rate for the age-period 20-25) in districts in which there is a large surplus of females between those ages. The female mortality from phthisis, on the other hand, is no higher in districts with a large surplus of males than in districts with a deficiency of males.

TABLE III.—SEX-RATIOS AND PHTHISIS MORTALITY-RATES (PER 1,000) IN SAMPLE OF DISTRICTS DRAWN FROM NORTH WALES (1861-70).

Name of registration district	15-20			20-25		
	Sex-ratio	Male phthisis-rate	Female phthisis-rate	Sex-ratio	Male phthisis-rate	Female phthisis-rate
Holywell ...	122	26 (27)	43	111	52	60
Knighton ...	117	24 (24)	26	127	45	59
Ruthin ...	114	16 (16)	34	105	56	57
Corwen ...	113	39 (39)	37	102	84	52
Forden ...	113	20 (21)	48	104	68	73
Newtown ...	112	41 (43)	47	103	71	60
Pembroke ...	111	27 (33)	35	111	44	48
Kington and Presteign	110	27 (27)	40	100	21	49
Bala ...	110	30 (34)	27	111	50	37
Rhayader ...	109	37 (34)	28	107	53	32
Crickhowell ...	107	16 (16)	32	104	43	50
Dolgelly ...	105	34 (36)	51	87	77	51
Carnarvon ...	105	42 (45)	64	95	93	68
Machynlleth ...	103	40 (41)	46	95	69	58
Hay ...	102	23 (23)	35	100	21	45
Llanfyllin ...	102	39 (38)	52	101	67	73
Llanrwst ...	101	37 (35)	58	94	69	59
Narberth ...	100	44 (41)	46	73	112	56
Builth ...	100	33 (33)	47	100	38	44
Anglesey ...	99	50 (48)	69	83	125	89
Llandovery ...	95	36 (40)	41	79	88	45
Conway ...	94	25 (23)	51	82	71	50
Tregaron ...	93	37 (33)	20	81	129	57
Llandilofawr ...	90	48 (48)	51	76	95	46
Lampeter ...	90	33 (30)	31	76	109	46
Aberystwith ...	90	40 (40)	31	77	70	43
Pwllbeli ...	88	35 (33)	38	78	75	51
Newcastle-in-Emlyn ...	85	51 (45)	39	71	111	44
Cardigan ...	79	53 (47)	39	56	113	49
Aberayron ...	77	69 (56)	39	56	136	42

For the meaning of the figures in parentheses, see the reply to the discussion.

(7) The most obvious step to take next is to select districts from a much smaller area, so that the effect of climatic conditions can be, at least partially, nullified. When dealing with registration districts throughout a small area of approximately constant climatic condition and racial constitution—e.g., the rural portions of Kent, Surrey and

Sussex, or the whole of North Wales—not sufficient can be found to be treated of as in the last two sections. But there is no reason why we should restrict ourselves to the use of absolute numbers. The same ideas can be expressed by means of the ratio of the numbers of males to females (henceforth called the sex-ratio) and the male and female

TABLE IVA.—SEX-RATIOS AND PHTHISIS MORTALITY-RATES (PER 1,000) IN SAMPLE OF DISTRICTS DRAWN FROM SURREY, KENT AND SUSSEX (1861-70).

Name of registration district	15-20			20-25		
	Sex-ratio	Male phthisis-rate	Female phthisis-rate	Sex-ratio	Male phthisis-rate	Female phthisis-rate
Sheppey	156	9	18	177	14	27
Elham	143	10	17	181	15	27
Thakeham	136	18	25	111	50	30
Uckfield	132	9	50	109	47	52
Cuckfield	128	8	45	97	42	39
Petworth	128	8	54	123	53	63
Hambledon	127	15	32	113	20	38
Eastry	125	13	25	110	26	45
Hailsham	123	16	53	111	37	63
Godstone	120	13	36	102	26	28
Bridge	120	9	27	98	34	52
Battle	120	6	33	106	24	52
Malling	119	14	39	100	42	44
East Grinstead	116	14	43	114	28	44
Westhampnett	116	27	45	98	50	65
Dorking	114	11	29	95	40	25
Hollingbourne	114	24	31	94	35	28
Milton	114	15	16	97	20	25
Ticehurst	113	16	42	91	39	51
Sevenoaks	112	13	30	95	33	57
Rye	111	11	24	98	40	54
Lewes	111	19	41	96	61	50
Horsham	111	20	42	110	19	56
Cranbrook	110	13	40	98	38	48
West Ashford	110	15	32	103	48	47
Faversham	110	21	31	94	23	31
Tenterden	108	18	33	91	30	70
East Ashford	108	16	23	107	35	52
Blean	96	16	38	81	58	43
Chichester	95	23	38	86	41	45

phthisis death-rates. Then all districts will be available for consideration. A district in which the sex-ratio is relatively high is one in which the males are relatively in excess and the females in defect, and we compare this with (a) the male phthisis death-rate to confirm or confute the conclusion of section (5), and (b) the female phthisis death-rate to corroborate or refute that of section (6). The regions chosen for detailed consideration in this manner were (i) thirty rural districts in

Central and North Wales, (ii) thirty districts in Kent, Surrey and Sussex, practically all rural, and (iii) thirty districts in Wiltshire, Dorset and South Devon. These last were mostly all rural, but were chosen by omitting the districts of very large and also those of very small population. This was not altogether a satisfactory choice as the

TABLE IVB.—SEX-RATIOS AND PHTHISIS MORTALITY-RATES (PER 1,000) IN SAMPLE OF DISTRICTS DRAWN FROM SURREY, KENT AND SUSSEX (1851-60).

Name of registration district	15-20			20-25		
	Sex-ratio	Male phthisis-rate	Female phthisis-rate	Sex-ratio	Male phthisis-rate	Female phthisis-rate
Sheppey ...	161	7	18	179	20	24
Uckfield ...	135	19	58	113	46	67
Godstone ...	129	18	32	106	27	54
Elham ...	129	16	22	191	20	31
Petworth ...	128	16	47	120	62	54
Hollingbourne ...	127	17	42	102	38	47
Thakeham ...	126	23	52	111	47	89
Hambleton ...	123	21	46	114	35	50
Malling ...	121	12	35	105	31	68
Milton ...	120	12	34	100	19	36
Bridge ...	119	20	49	102	44	66
Battle ...	119	20	24	118	28	45
Cuckfield ...	119	10	54	103	45	49
Hailsham ...	118	18	62	111	36	78
East Grinstead ...	117	23	39	108	36	51
Sevenoaks ...	116	19	33	95	36	52
East Ashford ...	116	20	61	107	33	64
Horsham ...	115	25	66	105	32	59
Ticehurst ...	114	17	49	93	43	53
Westhampnett ...	112	28	53	102	55	75
Dorking ...	111	15	36	96	41	63
Cranbrook ...	110	4	32	98	39	68
West Ashford ...	109	22	35	102	47	77
Eastry ...	109	15	30	103	48	42
Faversham ...	108	21	32	91	41	57
Lewes ...	107	28	47	94	65	68
Rye ...	105	24	25	90	23	77
Tenterden ...	104	20	36	93	40	77
Blean ...	94	20	36	81	25	50
Chichester ...	93	42	33	86	76	49

districts were not so homogeneous as regards general physical conditions as is desirable in such an investigation. The sex-ratio and male and female phthisis mortality-rates for each of the age-groups (15-20) and (20-25) for these three samples are given in Tables III to V. For convenience of inspection the districts are placed in the tables in descending order of sex-ratio of the 15-20 group. In the Welsh sample—Table III—it can readily be noticed that there is a distinct

tendency in each age-group for the districts of high and low sex-ratio to be those of light and heavy male mortality respectively. For comparative purposes I have formed three "composite districts"—(1) by combining the six districts with highest sex-ratio in each age-group, (2) by combining all the thirty districts together, and (3) by combining

TABLE V.—SEX-RATIOS AND PHTHISIS MORTALITY-RATES (PER 1,000) IN SAMPLE OF DISTRICTS DRAWN FROM WILTSHIRE, DORSET AND SOUTH DEVON (1861-70).

Name of registration district	15-20			20-25		
	Sex-ratio	Male phthisis-rate	Female phthisis-rate	Sex-ratio	Male phthisis-rate	Female phthisis-rate
Stoke Damerel ...	159	13	22	148	21	29
Highworth ...	131	17	33	126	26	48
Amesbury ...	126	18	39	90	21	29
Pewsey ...	120	18	37	98	45	29
Okehampton ...	117	9	23	101	35	37
Weymouth ...	115	7	20	119	26	23
Chippenham ...	114	15	36	90	41	38
Wimbourne ...	114	19	29	91	45	55
Crediton ...	114	16	31	98	39	33
Devizes ...	112	19	31	91	41	41
South Molton ...	112	17	26	101	42	37
Wareham ...	111	11	26	98	41	44
Tavistock ...	110	24	24	99	30	44
Dorchester ...	108	13	38	95	41	53
Blandford ...	107	15	21	85	39	33
Beaminster ...	107	6	38	82	36	44
Kingsbridge ...	99	19	29	79	56	46
Tiverton ...	99	15	30	83	54	55
Poole ...	98	20	32	82	38	46
Cricklade ...	96	23	29	89	34	43
Plympton ...	94	16	24	77	36	36
Honiton ...	93	15	30	77	32	44
Shaftesbury ...	92	17	33	80	34	45
Axminster ...	92	19	32	77	40	44
Bridport ...	90	22	15	73	21	41
Totnes ...	90	19	29	76	32	30
Bradford ...	87	11	23	83	41	41
Melksham ...	85	12	22	73	29	38
Exeter ...	78	20	22	68	42	31
Salisbury ...	75	23	17	77	48	21

the six (or seven) with lowest sex-ratio in each group. The results for the Welsh sample are given on p. 33.

For each age-group the inference is very marked. The "composite district" with high sex-ratio (deficiency of females) has a very considerably lower male phthisis mortality than that with low sex-ratio (excess of females), though its female mortality is slightly higher. On the other hand, the "composite district" with low sex-ratio (deficiency of

males) has a female phthisis mortality only slightly lower than that of the high sex-ratio (excess of males). It is more difficult, however, to draw conclusions concerning the mortality of the females, since, looked at from one point of view, the male rates indicate differences in the general level of phthisis mortality between the two "composite districts." There is danger at this point, however, of circular reasoning, and I shall not discuss these figures further.

	Number of males	Male deaths	Number of females	Female deaths	Sex-ratio	Male rate	Female rate
15-20.							
(1) ...	6,550 ...	185 ...	5,650 ...	233 ...	116 ...	28 ...	41 ...
(2) ...	27,000 ...	961 ...	26,300 ...	1,160 ...	103 ...	36 ...	44 ...
(3) ...	5,630 ...	259 ...	6,540 ...	249 ...	86 ...	46 ...	38 ...
20-25.							
(1) ...	4,850 ...	240 ...	4,360 ...	231 ...	111 ...	49 ...	53 ...
(2) ...	21,050 ...	1,588 ...	23,150 ...	1,314 ...	91 ...	75 ...	57 ...
(3) ...	3,480 ...	356 ...	5,010 ...	237 ...	69 ...	102 ...	47 ...

In the sample drawn from the South-eastern counties the same facts are brought out, but not quite so emphatically. Table IV_A gives the information for this sample for the decade 1861-70, and Table IV_B for the decade 1851-60. Forming three "composite districts" in the same manner as before, the following figures are reached for 1861-70 :—

	Number of males	Male deaths	Number of females	Female deaths	Sex-ratio	Male rate	Female rate
15-20.							
(1) ...	5,710 ...	56 ...	4,120 ...	133 ...	139 ...	10 ...	32 ...
(2) ...	24,400 ...	354 ...	20,550 ...	700 ...	119 ...	14.5 ...	34 ...
(3) ...	5,040 ...	90 ...	4,810 ...	164 ...	105 ...	18 ...	34 ...
20-25.							
(1) ...	5,940 ...	114 ...	3,910 ...	132 ...	152 ...	19 ...	34 ...
(2) ...	21,200 ...	701 ...	19,450 ...	857 ...	109 ...	33 ...	44 ...
(3) ...	3,470 ...	129 ...	3,880 ...	167 ...	89 ...	37 ...	43 ...

The corresponding figures for the decade 1851-60 are :—

	Number of males	Male deaths	Number of females	Female deaths	Sex-ratio	Male rate	Female rate
15-20.							
(1) ...	5,000 ...	76 ...	3,700 ...	130 ...	135 ...	15 ...	35 ...
(2) ...	23,050 ...	438 ...	1,980 ...	787 ...	116 ...	19 ...	40 ...
(3) ...	4,680 ...	124 ...	4,590 ...	167 ...	102 ...	26 ...	36 ...
20-25.							
(1) ...	5,430 ...	158 ...	3,660 ...	156 ...	148 ...	29 ...	43 ...
(2) ...	19,700 ...	754 ...	1,820 ...	1,024 ...	108 ...	38 ...	56 ...
(3) ...	3,270 ...	140 ...	3,680 ...	216 ...	89 ...	43 ...	59 ...

Looked at from the point of view of the male mortality, in both decades and for both age-groups, the mortality was considerably higher in the "composite district" in which females were relatively abundant than in that in which they were relatively scarce. This conclusion is most strongly supported in the case of the 15-20 group, since for that the female rates are practically the same. Looked at from the point of view of the female mortality, we cannot detect any association between that mortality and the relative scarcity or abundance of males so far as regards the 15-20 group. For the 20-25 group the mortality of the females is apparently least in the "composite district" in which the males are most abundant.

The data for the individual districts constituting the third sample—from Wiltshire, Dorset and South Devon—are shown in Table V, the epoch to which they refer being 1861-70.

The "composite districts" give the following details:—

Number of males			Male deaths		Number of females			Female deaths		Sex-ratio		Male rate		Female rate	
15-20.															
(1)	...	8,160	...	102	...	6,090	...	155	|	134	...	12·5	...	25	
(2)	...	31,100	...	496	...	29,300	...	800	|	106	...	16	...	27	
(3)	...	5,470	...	99	...	6,480	...	152	|	84	...	18	...	24	
20-25.															
(1)	...	8,810	...	238	...	7,250	...	249	|	122	...	27	...	34	
(2)	...	24,600	...	853	...	26,300	...	1,016	|	94	...	35	...	39	
(3)	..	6,110	...	213	...	8,260	...	292	|	74	...	35	...	35	

The selection of the districts for this sample was not a good one, greater variety in the nature of the district existing than in either of the previous two. The same experience, however, is manifest, though to a much less marked extent. The mortality of the males is still appreciably smaller in the "composite district" where there is a deficiency of females than in that in which there is a considerable surplus. But the mortality of the females is practically the same in the two "districts."

(8) I do not propose to discuss the data of any other samples in the manner employed in the last section. Such discussion would be mere reiteration of the facts already brought out, but could add little to those facts. More technical methods are necessary to bring out further details, and these are explained in the next section but one. So far, I believe I have demonstrated that phthisis mortality is most heavy among males in districts in which there is a relative abundance of females, but that no association is apparent between the mortality

of females from phthisis and the relative abundance of males. As pointed out in section (3), *under certain ideal conditions* (never actually realized) this would fairly strongly suggest the infective character of phthisis, and point also to a sexual difference in the manner of infection. It is necessary now to examine the various ways by which the association pointed out might arise through the extraneous influences causing deviation from the ideal. This examination cannot be complete until certain other facts, which cannot readily be discussed by the methods yet employed, are brought out, but I think it useful to deal with the points in some degree at this stage. I state them in an approximate order of importance.

(i) The association between male phthisis and excess of females might be attributable to the circumstance that the districts in which the females are relatively abundant happen to be those where the prevailing occupations of the males are those in which the phthisis mortality is heavy, and conversely that where the females are few the occupations of the males happen to be those showing light phthisis mortality. This requires some detailed examination, and is dealt with below.

(ii) The presence of reputed health resorts in the samples employed might assist in producing the association noted. In such resorts, females (chiefly domestic servants) are generally abundant and the death-rate from phthisis may be high from artificial causes. But we are dealing with a period fifty years ago when segregation of the phthisical from the masses was carried on to a very small extent. Moreover, if this were the reason for the association between high male phthisis mortality and excess of females we ought to find the phthisis mortality of the females also high in those places (unless, of course, we assume (a) that phthisical females did not segregate in the health resorts to the extent the males did, or (b) if they did so they did not die so rapidly as the males). Actually, however, we have found the mortality of the females no more in the "composite district" of low sex-ratio than in that of high sex-ratio. The Welsh sample, from which the most marked results have been derived, has a high level of mortality and contains no places which in 1861-70 were obvious health resorts. In addition, since registration districts are almost invariably conterminous with Poor Law districts, each containing its own workhouse, no serious effect is to be looked for through deaths of inmates in public institutions occurring in districts outside their own. I do not believe that the considerations mentioned in this paragraph can have had power to produce the association noted.

(iii) Practically all the districts in the three samples used were rural ones, and the period 1861-70 was one of active emigration from rural parts. To some degree the districts in which the excess of females was greatest were those from which the males had emigrated to the greatest extent. Assuming that the emigrants were not a random sample, but were taken to a greater extent from those less constitutionally prone to phthisis, the association indicated would be produced. Whether the assumption is justified or not must be a pure matter of opinion as no statistical material on the point exists. To explain, from this standpoint, the fact that the mortality of the females is apparently not associated with relative scarcity or abundance of males we must assume that the females who emigrated were a random sample, and not drawn more from those prone to phthisis than from the general female population. The point is worthy of a detailed investigation, but in this paper, beyond emphasizing that this is a purely hypothetical explanation, we can only note that the sexual difference has been found to hold for three quite independent samples (in which emigration was operative in varying degrees) and that certain other correlations referred to later (section 11) make the hypothesis less likely.

(iv) In districts of heavy mortality the males are affected to a greater extent than are the females. The consequence is that, assuming no migration, the sex-ratio in such districts diminishes with age faster than it does in districts under less stringent conditions. Thus in the "Selected Healthy Districts of England and Wales" for 1891-1900, of 1,000,000 persons born, the sex-ratios of those surviving at 15, 20, 25, 30, 35, and 40 were 100·5, 100·8, 100·6, 100·5, 100·3 and 100 respectively, and the corresponding figures for the whole of England and Wales were 99·4, 99·4, 99·1, 98·8, 98·4 and 97·7 (I am indebted to Mr. Greenwood for calling my attention to the tables from which these ratios have been formed—Tables F and K, Decennial Supplement for 1891-1900). If, therefore, registration areas were rigid compartments with no flow of population in or out other than by birth and death we should naturally derive an association between high general male mortality and low sex-ratio, and also high general female mortality and low sex-ratio, though the extent of variation of the sex-ratio would be small, and the phenomenon probably not readily apparent. Under such conditions the facts noted with regard to the mortality of the males might in this way be explained, but we should then also expect high female mortality (closely correlated with high general mortality) to accompany low sex-ratio, and this the evidence we have adduced does

not indicate. But the important point in connexion with this argument is that the large variations in sex-ratio are produced almost entirely by migration, and to a very small extent by differential death-rates. In the case of the Welsh districts, for example, the difference between the population aged 15-25 in 1861 and that aged 25-35 in 1871 is much more than can be accounted for by deaths alone. This consideration, therefore, cannot have been a potent cause in producing the presence of association in the case of males, and its apparent absence in the case of females. Furthermore, the facts brought out later, section (11), also tell against this.

(v) A point suggested to me by Mr. Greenwood—viz., that in districts with many suffering from phthisis there would be some influx of females as nurses (thus tending to produce a low sex-ratio)—can, I think, in the period 1861-70, have had effects only of a secondary order. The variation in the sex-ratio in the examples used is too big to be explained by this cause. Moreover, the association is most marked in that sample—from Wales—in which such nursing was probably carried on to the smallest extent, and, in addition, this explanation is quite inadequate to account for other facts.

(9) The point raised in (i) in the last section—viz., that the association detected between a low sex-ratio (relative surplus of females) and high male phthisis mortality might be explained by the possibility that districts of low sex-ratio happen to be the ones in which the prevailing male occupations are those generally reputed to be conducive to phthisis—at a cursory glance seems to have some truth in it. I first examined the occupations (as given by the census of 1871) of the Surrey, Kent, and Sussex sample, and I found that three of the districts had a large number of males “engaged on defence.” The figures of occupations in that census refer to all males over 20, and the following details for the three districts are instructive:—

District	Proportion of males over 20 “on defence”	15-20			20-25		
		Sex-ratio	Male phthisis	Female phthisis	Sex-ratio	Male phthisis	Female phthisis
Elham ...	34 per cent.	129, 143	16, 10	22, 17	191, 181	20, 15	31, 27
Sheppey ...	32 „	161, 156	7, 9	18, 18	179, 177	20, 14	24, 27
Eastry ...	11 „	109, 125	15, 13	30, 25	103, 110	48, 26	42, 45
Whole sample	4.5 „	116, 119	19, 14.5	40, 34	108, 100	38, 33	56, 44

In the last six columns two indices are given in each case : the first of these refers to the period 1851-60 and the second to 1861-70. Without discussing these figures in detail, it is fairly clear that in this sample a low male phthisis mortality is associated with a large proportion of the males being "engaged on defence." When these three districts are omitted from the sample the phenomenon described becomes much less marked, and it might be readily argued that only by the accident of including the districts of Elham and Sheppey in the sample has the association between high sex-ratio and low male phthisis mortality been made out. As these districts contain many men selected on account of superior physique no theory would be necessary to explain the association. But it is also noteworthy that the female phthisis mortality in these two districts is very considerably below that of practically all the other districts (Tables IVA and IVB), in fact, to a greater extent even (at any rate for the 15-20 group) than the male mortality. As it can hardly be asserted that the females in these districts are also selected, we cannot *definitely* argue that the low mortality of the males is due to a large proportion of them being selected individuals. Two of the districts in the Wiltshire, Dorset and South Devon sample contained a large proportion of men "on defence." These were Stoke Damerel and Weymouth, with 46 per cent. and 14 per cent. respectively. These are also districts in which not only the male but also the female mortality is below that of the great majority of the districts. I consider the inclusion of the former place in this sample to be unfortunate, as it is of urban nature. But the conclusion drawn above (of the association between low sex-ratio and high male mortality) from the data of this sample is not altered by omitting that district. On turning to the Welsh sample, only one district was found to contain an appreciable proportion of its males engaged "on defence." This was Pembroke, with 12 per cent., a district which showed male mortality-rates in the two age-groups of 27 and 44 and female rates of 35 and 48—all below the corresponding rates for the whole sample. But this district weighs but little in the sample, and, in fact, when it is omitted the association between high sex-ratio and low male mortality becomes slightly more marked—*see* section (11). It cannot be asserted, therefore, that the inclusion of certain selected bodies of men engaged on military or naval service has been the *cause* of the phenomenon described. This is most marked in the sample containing practically no men so engaged.

A complete analysis of occupations from the point of view of their

possible effect upon mortality is a long and rather difficult process, since the census (1871) classification of occupations in registration districts is given only under certain comprehensive headings. In the case of the Welsh sample, I give below the proportions under some of these headings for the districts with highest and those with lowest sex-ratio. The actual ratios are shown in Table III. The proportion of males working "in Minerals" is included in the proportion working "in Industry." As the districts do not vary greatly in size, the averages of the ratios shown are a satisfactory substitute for the corresponding ratios of a "composite district," and these are added.

District	MORTALITY-RATES						PERCENTAGE OF THE MALE POPULATION OVER 20 WORKING IN				Percentage of females over 20 in domestic class	
	15-20		20-25									
	Male	Female	Male	Female	Agriculture	Industry	Minerals					
Of high sex-ratio (<i>see</i> Table III).												
Holywell	...	26	43	...	52	60	...	18	55	34	...	87
Knighton	...	24	26	...	45	59	...	59	22	5	...	81
Ruthin	...	16	34	...	56	57	...	52	27	11	...	84
Corwen	...	39	37	...	50	37	...	46	35	15	...	81
Forden	...	20	48	...	68	73	...	40	37	15	...	84
Newtown	...	41	47	...	71	60	...	43	40	13	...	72
Pembroke	...	27	35	...	44	48	...	19	33	5	...	82
Bala ...	...	30	27	...	50	37	...	60	26	5	...	74
Rhayader	...	37	28	...	53	32	...	59	24	6	...	79
Average	...	29	36		54	51		44	33	12		80
Of low sex-ratio (<i>see</i> Table III).												
Aberayron	...	69	39	...	136	42	...	48	27	3	...	74
Cardigan	...	53	39	...	113	49	...	43	26	4	...	76
Newcastle	...	51	39	...	111	44	...	61	29	6	...	72
Pwllheli	...	35	38	...	75	51	...	50	25	7	...	80
Llandilofawr	...	48	51	...	95	46	...	47	34	15	...	75
Lampeter	...	33	31	...	109	46	...	60	23	4	...	70
Aberystwith	...	40	31	...	70	43	...	27	49	26	...	83
Narberth	...	44	46	...	112	56	...	48	29	10	...	78
Average	...	48	39		103	47		48	30	9		76

The two groups differ but little in general occupational distribution, and the figures of occupation do not suggest any obvious explanation of those of mortality. The comparison of individual districts showing approximately the same occupation distribution is instructive. Holywell with Aberystwith; Bala with Newcastle and Lampeter; Corwen with Llandilofawr—in each case in one or other or both age-groups, the district of lowest sex-ratio has markedly the highest male mortality.

I have only just touched upon the question of occupation. To deal thoroughly with it would mean to double the length of the paper. Nothing, however, has been brought out in this superficial examination which suggests that differences of occupation (which themselves produce considerable variations in sex-ratio), are the *cause* of the differences in mortality which have been remarked. Further discussion on this subject is postponed until section (14), when a further fact can be brought into the argument.

(10) I have dealt in detail, and so far without the use of technical statistical implements, with the association between sex-ratio and male and female phthisis mortality for two age-groups. In order to extend the scope of the investigation and to give more definiteness to the results obtained, I now propose to introduce technical methods. The general advantage of this will, I hope, be apparent after the results have been described, but in particular such methods allow us to inquire into a subject which cannot properly be discussed at all in general terms. This is the association between an excess of males (females) in one age-group and the mortality from phthisis of the males (females) in another. Since, in the samples we have dealt with, the amount of variation of the ratio of the number of males (females) in one age-group to the number in another is very small, simple tabulation is not sufficient to bring out the facts. By the use of "partial correlation," however, much more information can be got out of the data.

So many *possible* causes are operating, all at the same time, in producing variations in the amount of phthisis, that only by rendering certain of them constant in turn, and considering the effects of a few only, can the *real causes* of the variation be ascertained. Overcrowding, opportunity for infection, hereditary disposition, amount of institutional segregation, occupation, &c., are all acting together, and to find the effect of any one, populations should be selected for which the other factors are constant. This can only be done by the statistical artifice of partial correlation. For example, much of the evidence on the two points of domestic infection and hereditary disposition is inevitably interwoven, and the relative potency of these two factors in producing phthisis will not be ascertained until data are forthcoming to enable the statistician to compare the relationship between phthisis and domestic infection for "constant hereditary disposition" with the relationship between phthisis and hereditary disposition for "constant domestic infection." These, however, are problems for the future.

(11) The method of partial correlation enables us to measure the extent of relationship between two varying phenomena, when other interacting phenomena are kept constant throughout the series of observations. Thus the results found in section (7) could be come at by finding (a) the partial correlation between the number of male deaths from phthisis (15-20 or 20-25) and the actual number of females (15-20 or 20-25) when the actual number of males (15-20 or 20-25) is constant; and (b) the partial correlation between the number of female deaths from phthisis and the actual number of males when the actual number of females is constant. With the notation employed in section (3), these correlations are denoted by $M_1 r_{F_1 m_1}$ or $M_2 r_{F_2 m_2}$ and $F_1 r_{M_1 f}$ or $F_2 r_{M_2 f}$, the particular population which is fixed being indicated by the capital letter written before the r , and the varying population by the capital letter written after. We can find the association between an excess of males in one age-group and the mortality among the (fixed number of) males of another group by such coefficients as $M_1 r_{M_1 m_1}$, $M_1 r_{M_3 m_1}$, $M_2 r_{M_1 m_2}$, &c., and similarly for the females. But we need not stop here. We can find the association between the number of deaths among the (constant number of) males (15-20) and the aggregate of the females in the *other* age-groups, and so on. I indicate the number of males (or females) in the aggregate of the age-groups 15-45, less a particular one age-group, by appending a stroke to the corresponding letter denoting the particular age-group. Thus M_1' denotes the number of males in all age-groups other than 15-20—i.e., from 20-45; M_2' denotes the number from 15-20 plus the number from 25-45, and so on. Similarly for the females. Then the correlation between the number of deaths among the (constant number of) males 15-20 and the number of females 20-45 is denoted by $M_1 r_{F_1' m_1}$, and so on.

Many correlations have been worked out for the two samples from Wales and the South-eastern counties, not so many for the sample from the South-western counties, and some also for a sample of forty districts (the first actually dealt with) taken from larger registration districts throughout the South and Midland counties.¹

Consider first the associations obtained from fixing the number of males 15-20 (M_1) and varying the number of females in different age-groups. The following results have been found :—

¹ As not many results for this sample of forty districts are given, it is hardly necessary to give a list of the places. The criterion of selection was that the population was roughly between 50,000 and 100,000. They were consequently practically all urban districts.

(1A) CORRELATIONS BETWEEN MORTALITY OF MALES (15-20) AND NUMBER OF FEMALES IN VARIOUS AGE-GROUPS.

Sample	$M_1 r_{F_1 m_1}$	$M_1 r_{F_2 m_1}$	$M_1 r_{F_3 m_1}$	$M_1 r_{F_4 m_1}$	$M_1 r_{F_1^1 m_1}$	$M_1 r_{F_2^1 m_1}$	$M_1 r_{F_3^1 m_1}$	$M_1 r_{F_4^1 m_1}$
Wales ...	0.73*	0.66	0.58	0.46	0.60	0.65	0.67	0.69
South-eastern counties ...	0.68†	0.61	0.54	0.58	0.62	0.64	0.66	0.65
South-western counties ...	0.42	0.27	0.26	0.35	—	—	—	—
Forty districts	0.41	0.28	0.28	0.38	—	—	—	—

* The corresponding correlation, when the district of Pembroke is left out—see section (9)—is 0.74.

† When this correlation is corrected for “constant area”—i.e., $M_1 A r_{F_1 m_1}$ —it is reduced to 0.67.

In considering these numbers it should be remembered that such a correlation as $M_1 r_{F_1 m_1}$ does not indicate the association between male mortality (15-20) and the number of females (15-20) alone, since the number of females in other age-groups varies, and the result may, indirectly, be due to them. To determine the association for one particular age-group alone further correction is necessary and a correlation such as $M_1 F_1^1 r_{F_1 m_1}$ formed. This is dealt with later—section (12). Without discussing these figures in detail, it will be agreed that they signify a moderately high degree of association between the mortality of males (15-20) from phthisis and excess of females.

Next consider the results reached from fixing the number of females (15-20) and varying the number of males in the different age-groups:—

(1B) CORRELATIONS BETWEEN MORTALITY OF FEMALES (15-20) AND NUMBER OF MALES IN VARIOUS AGE-GROUPS.

Sample	$F_1 r_{M_1 f_1}$	$F_1 r_{M_2 f_1}$	$F_1 r_{M_3 f_1}$	$F_1 r_{M_4 f_1}$	$F_1 r_{M_1^1 f_1}$	$F_1 r_{M_2^1 f_1}$	$F_1 r_{M_3^1 f_1}$	$F_1 r_{M_4^1 f_1}$
Wales ...	-0.01*	0.12	-0.02	-0.04	-0.07	-0.16	-0.20	-0.17
South-eastern counties ...	-0.37	-0.57	-0.51	-0.21	-0.53	-0.42	-0.51	—
South-western counties ...	0.00	-0.14	-0.11	—	—	—	—	—
Forty districts	-0.20	-0.16	-0.17	-0.22	—	—	—	—

* The corresponding correlation, when the district of Pembroke is left out—see Section (9)—is +0.05.

These figures are altogether different from those shown in (1A) above; most of them do not significantly differ from zero. In the case of the sample from the South-eastern counties, however, there appears to be a significantly negative correlation between excess of males and phthisis

in the females. This is largely produced by the two districts of Elham and Sheppey—see section (9). The low mortality from phthisis (both of males and females) in these districts in which military were stationed has already been commented upon—see also Tables IVA and IVB. We are warranted from the above figures in drawing the conclusion that there is no positive correlation between phthisis mortality of females (15-20) and excess of males.

Not so many correlations can be found to indicate the association between the mortality of the (constant number of) males (females) of one age-group and the number of males (females) in the others, and the results when fixing the 15-20 group can be arranged as follows:—

(1C) CORRELATIONS BETWEEN THE MORTALITY OF MALES (FEMALES) 15-20 AND THE NUMBER OF MALES (FEMALES) IN OTHER AGE-GROUPS.

Sample	MALES				FEMALES			
	$M_1 r_{M_2 m_1}$	$M_1 r_{M_3 m_1}$	$M_1 r_{M_4 m_1}$	$M_1 r_{M_1 m_1}^1$	$F_1 r_{F_2 f_1}$	$F_1 r_{F_3 f_1}$	$F_1 r_{F_4 f_1}$	$F_1 r_{F_1 f_1}^1$
Wales ...	-0.58	-0.64	-0.44	-0.70	-0.10	0.00	0.10	0.00
South-eastern counties ...	-0.24	0.02	0.46	0.03	-0.49	-0.26	0.20	-0.15
South-western counties ...	-0.46	-0.38	0.39	—	-0.17	0.02	—	—
Forty districts	0.04	0.03	0.15	—	-0.14	-0.06	-0.12	—

The noticeable features in these figures is the persistence of large negative values in the results derived from the Welsh sample for the mortality of the males. A likely partial explanation of this is that the districts of heavy mortality lose more males than do those of light mortality; so that, starting with M_1 constant, where m_1 is greatest M_2 will be least. We should also expect to get comparable negative values for the females, but this we do not. Moreover, applying the same argument, where M_1 is fixed and m_1 large, not only will M_2 , but also F_2 (highly correlated with M_2), be relatively small. There is some tendency towards negative values, therefore, even in (1A), where we have found high positive values. This, too, may be some partial explanation of the negative values found in (1B) for the South-eastern counties.

So far as the 15-20 group is concerned, we can only definitely assert a positive association to exist between the male mortality of that group and excess of females in all age-groups. We must note, however, that so far we have dealt only with the mortality of a young group, and excess of males and females chiefly in older age-groups.

The corresponding associations reached through fixing the male (M_2) population (20-25), and again the female (F_2) population (20-25), are:—

(2A) CORRELATIONS BETWEEN MORTALITY OF MALES (20-25) AND NUMBER OF FEMALES IN VARIOUS AGE-GROUPS.

Sample	$M_2 r_{F_1 m_2}$	$M_2 r_{F_2 m_2}$	$M_2 r_{F_3 m_2}$	$M_2 r_{F_4 m_2}$	$M_2 r_{F_1^1 m_2}$	$M_2 r_{F_2^1 m_2}$	$M_2 r_{F_3^1 m_2}$	$M_2 r_{F_4^1 m_2}$
Wales ...	0.75	0.76	0.73	0.64	0.73	0.74	0.75	0.77
South-eastern counties ...	0.65	0.64*	0.63	0.69	0.67	0.64	0.68	0.65
South-western counties ...	0.65	0.58	—	—	—	—	—	—
Forty districts	0.37	0.34	—	—	—	—	—	—

* When this correlation is corrected for "constant area"—i.e., $M_2 A r_{F_2 m_2}$ —it is reduced to 0.60.

(2B) CORRELATIONS BETWEEN MORTALITY OF FEMALES (20-25) AND NUMBER OF MALES IN VARIOUS AGE-GROUPS.

Sample	$F_2 r_{M_1 f_2}$	$F_2 r_{M_2 f_2}$	$F_2 r_{M_3 f_2}$	$F_2 r_{M_4 f_2}$	$F_2 r_{M_1^1 f_2}$	$F_2 r_{M_2^1 f_2}$	$F_2 r_{M_3^1 f_2}$	$F_2 r_{M_4^1 f_2}$
Wales ...	0.33	0.15	0.30	0.37	0.27	0.34	0.28	0.26
South-eastern counties ...	-0.04	-0.44	-0.42	0.13	-0.36	-0.62	-0.26	—
South-western counties ...	0.08	-0.24	—	—	—	—	—	—
Forty districts	-0.00	0.03	—	—	—	—	—	—

(2C) CORRELATIONS BETWEEN THE MORTALITY OF MALES (FEMALES) (20-25) AND THE NUMBER OF MALES (FEMALES) IN OTHER AGE-GROUPS.

Sample	Males				Females			
	$M_2 r_{M_1 m_2}$	$M_2 r_{M_3 m_2}$	$M_2 r_{M_4 m_2}$	$M_2 r_{M_2^1 m_2}$	$F_2 r_{F_1 f_2}$	$F_2 r_{F_3 f_2}$	$F_2 r_{F_4 f_2}$	$F_2 r_{F_2^1 f_2}$
Wales ...	0.60	0.03	0.21	0.40	0.47	0.34	0.49	0.56
South-eastern counties ...	0.59	0.39	0.57	0.58	0.69	0.12	0.46	0.52
South-western counties ...	0.57	—	—	—	0.60	—	—	—
Forty districts	0.01	—	—	—	0.18	—	—	—

In discussing these figures it must be remembered that when we fix the population (male or female) in the 20-25 age-group, and allow the populations in the other groups to vary, the variation is due in part to a younger population and in part to an older one. Thus, assuming that our populations are truly of the ideal character described in section (3), we should now possibly be able to detect if there is any variation in communicability according to age. Comparing the figures in (2A) with those in (1A) no differences are discernible, the correlations being all moderately large. In (2B) the same kind of difference between the figures for the Wales sample and those of the sample drawn from the South-eastern counties as in (1B) is to be noticed. Confining attention to those of the Wales sample (as being probably the most satisfactory

one), in the comparison of (2B) with (1B), it will be noticed that the figures for the former are uniformly higher than those for the latter, though, considered in regard to the probable errors, the difference in any single case is not certainly significant. When we contrast the figures in (2c) with those in (1c) a striking difference is manifest. In place of many negative correlations in the latter we have now all positive correlations, some of a moderately large magnitude. There is a natural tendency for the correlation $M_2 r_{M_1 m_2}$ to be positive, since, ignoring the effect of migration, when M_2 is fixed, if m_2 is large M_1 must be large. On the other hand, there is a tendency for $M_2 r_{M_3 m_3}$ to be negative, and this may explain the large difference between the values of those correlations.

The associations found through fixing the 25-35 populations are:—

3A) CORRELATIONS BETWEEN MORTALITY OF MALES (25-35) AND NUMBER OF FEMALES IN VARIOUS AGE-GROUPS.

Sample	$M_3 r_{F_1 m_3}$	$M_3 r_{F_2 m_3}$	$M_3 r_{F_3 m_3}$	$M_3 r_{F_4 m_3}$	$M_3 r_{F_1 m_3}^1$	$M_3 r_{F_2 m_3}^1$	$M_3 r_{F_3 m_3}^1$	$M_3 r_{F_4 m_3}^1$
Wales ...	0.77	0.75	0.76	0.71	0.76	0.78	0.77	0.78
South-eastern counties ...	0.68	0.73	0.70	0.66	0.72	0.70	0.71	0.72
South-western counties ...	0.58	—	0.63	—	—	—	—	—
Forty districts	-0.03	—	0.14	—	—	—	—	—

(3B) CORRELATIONS BETWEEN MORTALITY OF FEMALES (25-35) AND NUMBER OF MALES IN VARIOUS AGE-GROUPS.

Sample	$F_3 r_{M_1 f_3}$	$F_3 r_{M_2 f_3}$	$F_3 r_{M_3 f_3}$	$F_3 r_{M_4 f_3}$	$F_3 r_{M_1 f_3}^1$	$F_3 r_{M_2 f_3}^1$	$F_3 r_{M_3 f_3}^1$	$F_3 r_{M_4 f_3}^1$
Wales ...	0.39	0.27	0.27	0.23	0.27	0.32	0.32	0.32
South-eastern counties ...	-0.19	-0.35	-0.41	-0.02	-0.26	-0.15	-0.29	-0.28
South-western counties ...	0.08	—	-0.23	—	—	—	—	—
Forty districts	0.18	—	0.07	—	—	—	—	—

(3C) CORRELATIONS BETWEEN MORTALITY OF MALES (FEMALES) (25-35) AND THE NUMBER OF MALES (FEMALES) IN OTHER AGE-GROUPS.

Sample	Males				Females			
	$M_3 r_{M_1 m_3}$	$M_3 r_{M_2 m_3}$	$M_3 r_{M_4 m_3}$	$M_3 r_{M_3 m_3}^1$	$F_3 r_{F_1 f_3}$	$F_3 r_{F_2 f_3}$	$F_3 r_{F_4 f_3}$	$F_3 r_{F_3 f_3}^1$
Wales ...	0.63	0.14	0.30	0.55	0.42	0.36	0.18	0.42
South-eastern counties ...	0.73	0.00	0.51	0.70	0.60	0.22	0.54	0.71
South-western counties ...	0.35	—	—	—	0.03	—	—	—
Forty districts	-0.39	—	—	—	-0.12	—	—	—

These results are very similar to those shown in (2A), (2B), and (2C)—viz., moderate correlation between the male mortality (25-35) and excess of females, no significant correlation between female mortality (25-35) and excess of males, and fair correlation between the male (female) mortality (25-35) and excess of males (females) in other age-groups.

The corresponding figures for the 35-45 group are:—

(4A) CORRELATIONS BETWEEN MORTALITY OF MALES (35-45) AND NUMBER OF FEMALES IN VARIOUS AGE-GROUPS.

Sample	$M_4 r_{F_1 m_4}$	$M_4 r_{F_2 m_4}$	$M_4 r_{F_3 m_4}$	$M_4 r_{F_4 m_4}$	$M_4 r_{F_1^1 m_4}$	$M_4 r_{F_2^1 m_4}$	$M_4 r_{F_3^1 m_4}$	$M_4 r_{F_4^1 m_4}$
Wales ...	0.58	0.49	0.46	0.53	0.50	0.56	0.55	0.53
South-eastern counties ...	0.60	0.49	0.36	0.43	0.48	0.51	0.55	0.53
South-western counties ...	—	—	—	0.40	—	—	—	—
Forty districts	-0.09	—	—	0.36	—	—	—	—

(4B) CORRELATIONS BETWEEN MORTALITY OF FEMALES (35-45) AND NUMBER OF MALES IN VARIOUS AGE-GROUPS.

Sample	$F_4 r_{M_1 f_4}$	$F_4 r_{M_2 f_4}$	$F_4 r_{M_3 f_4}$	$F_4 r_{M_4 f_4}$	$F_4 r_{M_1^1 f_4}$	$F_4 r_{M_2^1 f_4}$	$F_4 r_{M_3^1 f_4}$	$F_4 r_{M_4^1 f_4}$
Wales ...	-0.10	-0.22	-0.51	-0.21	-0.38	-0.28	-0.18	-0.27
South-eastern counties ...	-0.13	-0.36	-0.35	-0.00	-0.31	-0.19	-0.25	-0.31
South-western counties ...	-0.11	—	—	-0.08	—	—	—	—
Forty districts	-0.21	—	—	0.16	—	—	—	—

(4C) CORRELATIONS BETWEEN MORTALITY OF MALES (FEMALES) (35-45), AND NUMBER OF MALES (FEMALES) IN OTHER AGE-GROUPS.

Sample	Males				Females			
	$M_4 r_{M_1 m_4}$	$M_4 r_{M_2 m_4}$	$M_4 r_{M_3 m_4}$	$M_4 r_{M_4 m_4}$	$F_4 r_{F_1 f_4}$	$F_4 r_{F_2 f_4}$	$F_4 r_{F_3 f_4}$	$F_4 r_{F_4 f_4}$
Wales ...	0.23	-0.19	-0.30	-0.05	0.27	0.19	0.12	0.23
South-eastern counties ..	0.23	0.01	-0.04	0.05	0.05	-0.27	-0.31	-0.19
South-western counties ..	-0.08	—	—	—	—	—	—	—
Forty districts	-0.44	—	—	—	-0.21	—	—	—

The figures in (4A) are smaller than the corresponding ones found in (1), (2), and (3); those in (4B) are now negative, even for the Welsh sample; and those in (4C) do not indicate any significant correlation at all.

The general conclusions *suggested* by the results of this section are:—

(i) The mortality from phthisis of males in any age-group is positively associated with excess of females in all age-groups.

(ii) The evidence of the existence of corresponding association between female phthisis and excess of males is rather conflicting. The correlations are much smaller, and for the sample from Surrey, Kent, and Sussex are all negative. For the sample drawn from Wales they are negative in the first and last age-groups and positive in the others. Even for the Welsh sample we are not justified in concluding that an excess of males is, on the whole, accompanied by heavier phthisis mortality among the females.

(iii) An excess of young males is, on the whole, associated with heavier phthisis mortality among older males up to age 35, and similarly for females. An excess of older males, however, does not appear to be accompanied by heavier phthisis mortality among the younger males, and similarly again for the females. We must not overlook, however, the natural correlations referred to above, which would be produced under this head if migration were entirely absent. A difficulty in the way of accepting this as an adequate explanation, however, is that in (4c), which refers to an age-period in which emigration is smallest, we get low and many negative correlations; and it is here that we should expect, if the natural tendency referred to were important, the highest positive values.¹

(12) As pointed out before, such a correlation as $M_1 r_{F, m_1}$, which indicates the association between excess of females (15-20) and mortality of the males (15-20), does not necessarily show the concomitant variation in the male mortality which accompanies a variation in the number of females (15-20) alone, since the number of females in other age-groups may vary. To find the result when the number of females

¹ Some light is thrown upon this point by considering the extent of the variations which give rise to the correlations $M_2 r_{M_1 m_2}$ and $M_4 r_{M_3 m_4}$. If migration were entirely absent we should expect both of these to be positive. The actual migration of 1861-70, too, should affect the former more than the latter. The following figures are instructive in this connexion:—

		Means									
		M_1	M_2	M_3	M_4	m_2	m_4	$M_2 \sigma_{M_1}$	$M_2 \sigma_{m_2}$	$M_4 \sigma_{M_3}$	$M_4 \sigma_{m_4}$
Wales	...	900	702	1,107	923	53	40	71	10.8	93	7.3
South-eastern											
counties	...	814	707	1,090	884	23	29	118	9.9	163	7.7

Bearing in mind that in the whole of England and Wales in 1861-70 deaths among males (20-25) from phthisis were 46 per cent. of the corresponding total male deaths and for the age group 35-45 were 31 per cent. of the total, we see that after fixing M_2 and M_1 there was much more variation in M_1 and M_3 than could have been produced by deaths alone. These figures indicate that something more potent than the natural tendency of the deaths was acting to produce the difference between the values of $M_2 r_{M_1 m_2}$ and $M_4 r_{M_3 m_4}$.

(15-20) alone varies we must fix the number of females in the other age-groups 20-45, and form the partial correlation of the second order, $M_1F_1^1r_{F_{1m_1}}$. Similarly, when the number of females (20-25) alone varies we require $M_1F_2^1r_{F_{2m_1}}$; when the number of females (25-35) alone varies $M_1F_3^1r_{F_{3m_1}}$, and so on. At the same time, as we are getting $M_1F_1^1r_{F_{1m_1}}$,—the correlation between the mortality of the males (15-20) and the number of females in the age-group (15-20) alone—we can readily find $M_1F_1^1r_{F_{1m_1}}$,—the correlation between the mortality of the males (15-20) and the number of females in the group (20-45) alone. Such correlations as these will enable us to detect any fluctuations in the magnitudes of the correlations according to age. The first results shown are those indicating the association between the mortality of the males (15-20) and excess of females in particular age-groups, and also those between the mortality of the females (15-20) and excess of males in particular age-groups.

(5A) CORRELATIONS BETWEEN MORTALITY OF MALES (15-20) AND NUMBER OF FEMALES IN particular AGE-GROUPS.

Sample	$M_1F_1^1r_{F_{1m_1}}$	$M_1F_2^1r_{F_{2m_1}}$	$M_1F_3^1r_{F_{3m_1}}$	$M_1F_4^1r_{F_{4m_1}}$	$M_1F_1^1r_{F_{1m_1}}$	$M_1F_2^1r_{F_{2m_1}}$	$M_1F_3^1r_{F_{3m_1}}$	$M_1F_4^1r_{F_{4m_1}}$
Wales ...	0.51	0.20	-0.00	-0.20	-0.11	0.19	0.40	0.61
S o u t h - e a s t e r n c o u n t i e s	0.36	0.17	-0.23	0.08	0.03	0.29	0.50	0.35

(5B) CORRELATIONS BETWEEN MORTALITY OF FEMALES (15-20) AND NUMBER OF MALES IN particular AGE-GROUPS.

Sample	$F_1M_1^1r_{M_{1f_1}}$	$F_1M_2^1r_{M_{2f_1}}$	$F_1M_3^1r_{M_{3f_1}}$	$F_1M_4^1r_{M_{4f_1}}$	$F_1M_1^1r_{M_{1f_1}}$	$F_1M_2^1r_{M_{2f_1}}$	$F_1M_3^1r_{M_{3f_1}}$	$F_1M_4^1r_{M_{4f_1}}$
Wales ...	0.17	0.06	0.14	0.21	-0.18	-0.12	-0.15	-0.26
S o u t h - e a s t e r n c o u n t i e s	0.14	-0.44	-0.11	-0.52	-0.35	0.08	-0.09	0.11

The results for the two samples in (5A) agree quite well, and the tendency of the figures is marked. There is no space to describe in detail the significance of each particular correlation, but the general conclusion to be drawn from them is that the mortality of males (15-20) is moderately associated with excess of females at the *young* ages (15-25), but not at all at higher ages, and that the association diminishes fairly regularly with age.¹ No positive conclusions, however,

¹ The whole eight correlations in the row have been taken into account in forming this conclusion. In $M_1F_4^1r_{F_{4m_1}}$, for example, the females (15-20) have considerable weight, which is able to exhibit itself by reason of the fact that F_4 —the females 35-45—have been allowed for. In $M_1F_3^1r_{F_{3m_1}}$, however, the tendency of the females (15-20) is partially hidden by the inclusion of the females (35-45) in F_3 .

can definitely be drawn from the figures in (5B). We cannot, on the strength of these, suggest that the phthisis mortality of females (15-20) is in any way associated with excess of males in any particular age-group.

When we fix the populations in the 20-25 group, the results are:—

(6A) CORRELATIONS BETWEEN MORTALITY OF MALES (20-25) AND NUMBER OF FEMALES IN particular AGE-GROUPS.

Sample	$M_2F_1^1r_{F_1m_2}$	$M_2F_2^1r_{F_2m_2}$	$M_2F_3^1r_{F_3m_2}$	$M_2F_4^1r_{F_4m_2}$	$M_2F_1^1r_{F_1m_2}$	$M_2F_2^1r_{F_2m_2}$	$M_2F_3^1r_{F_3m_2}$	$M_2F_4^1r_{F_4m_2}$
Wales ...	0.28	0.26	0.11	-0.13	0.14	0.13	0.27	0.56
South-eastern counties	-0.02	-0.05	-0.17	-0.09	0.25	0.27	0.35	0.33

(6B) CORRELATIONS BETWEEN MORTALITY OF FEMALES (20-25) AND NUMBER OF MALES IN particular AGE-GROUPS.

Sample	$F_2M_1^1r_{M_1f_2}$	$F_2M_2^1r_{M_2f_2}$	$F_2M_3^1r_{M_3f_2}$	$F_2M_4^1r_{M_4f_2}$	$F_2M_1^1r_{M_1f_2}$	$F_2M_2^1r_{M_2f_2}$	$F_2M_3^1r_{M_3f_2}$	$F_2M_4^1r_{M_4f_2}$
Wales ...	0.24	-0.45	0.11	0.29	-0.13	0.53	-0.04	-0.14
South-eastern counties	0.32	-0.48	-0.43	0.28	-0.46	0.23	0.23	-0.44

The agreement between the samples in this case is not nearly so marked, and certain irregularities occur which make it difficult to draw general conclusions. The correlations arising out of variations in the number of males or females in any one particular age-group only are not large nor regular enough to be specially noted. From the last two correlations in (6A) we notice appreciable association between the mortality of the males 20-25 and excess of females in certain combined age-groups in which 15-25 predominates. On the whole, these figures point in the same direction as those in (5A), and again indicate association between phthisis mortality of males and excess of females up to 25. A curious feature of the results in (6B) is that certain similar irregularities occur in each sample. When we take all the figures into account, we cannot assert any general correlation to exist between the mortality of the females and excess of males.

The corresponding results for the 25-35 group are shown on p. 50.

The correlations here due to populations in single age-groups are (with one exception) small and irregular; those between the mortality of the males and excess of females in combinations of age-groups, however, point in the same direction as before—viz., an association between phthisis mortality of males and excess of females up to 25 or so. One

feature is prominent in the results of (7B) which also existed, though less prominently, in (6A). This is, for both samples, a correlation between mortality of females 25-35 and also 20-25 and excess of males in the 15-20 group. Apart from this, no positive conclusions are suggested by the figures in (7B).

(7A) CORRELATIONS BETWEEN MORTALITY OF MALES (25-35) AND NUMBER OF FEMALES IN *particular* AGE-GROUPS.

Sample	$M_3F_1^1r$	F_{1m_3}	$M_3F_2^1r$	F_{2m_3}	$M_3F_3^1r$	F_{3m_3}	$M_3F_4^1r$	F_{4m_3}	$M_3F_1^1r$	F_{1m_3}	$M_3F_2^1r$	F_{2m_3}	$M_3F_3^1r$	F_{3m_3}	$M_3F_4^1r$	F_{4m_3}
Wales ...	0.28		0.02		0.16		0.07		0.13		0.34		0.24		0.46	
South-eastern counties	0.00		-0.30		0.12		0.01		0.30		0.02		0.07		0.39	

(7B) CORRELATIONS BETWEEN MORTALITY OF FEMALES (25-35) AND NUMBER OF MALES IN *particular* AGE-GROUPS.

Sample	$F_3M_1^1r_{M_1f_3}$	$F_3M_2^1r_{M_2f_3}$	$F_3M_3^1r_{M_3f_3}$	$F_3M_4^1r_{M_4f_4}$	$F_3M_1^1r_{M_1f_3}$	$F_3M_2^1r_{M_2f_3}$	$F_3M_3^1r_{M_3f_3}$	$F_3M_4^1r_{M_4f_4}$
Wales ...	0.35	-0.06	-0.14	-0.08	-0.20	0.19	0.23	-0.25
South-eastern counties	0.45	-0.37	-0.36	0.14	-0.19	0.19	0.21	-0.31

Finally, when the populations of the 35-45 group are fixed, the results are:—

(8A) CORRELATIONS BETWEEN MORTALITY OF MALES (35-45) AND NUMBER OF FEMALES IN *particular* AGE-GROUPS.

Sample	$M_4F_1^1r$	F_{1m_4}	$M_4F_2^1r$	F_{2m_4}	$M_4F_3^1r$	F_{3m_4}	$M_4F_4^1r$	F_{4m_4}	$M_4F_1^1r$	F_{1m_4}	$M_4F_2^1r$	F_{2m_4}	$M_4F_3^1r$	F_{3m_4}	$M_4F_4^1r$	F_{4m_4}
Wales ...	0.35		-0.17		-0.15		0.18		-0.12		0.42		0.36		0.17	
South-eastern counties	0.44		0.14		-0.38		0.06		-0.20		0.21		0.57		0.33	

(8B) CORRELATIONS BETWEEN MORTALITY OF FEMALES (35-45) AND NUMBER OF MALES IN *particular* AGE-GROUPS.

Sample	$F_4M_1^1r$	M_{1f_4}	$F_4M_2^1r$	M_{2f_4}	$F_4M_3^1r$	M_{3f_4}	$F_4M_4^1r$	M_{4f_4}	$F_4M_1^1r$	M_{1f_4}	$F_4M_2^1r$	M_{2f_4}	$F_4M_3^1r$	M_{3f_4}	$F_4M_4^1r$	M_{4f_4}
Wales ...	0.42		-0.10		-0.36		-0.06		-0.49		0.03		0.29		-0.05	
South-eastern counties	0.28		-0.45		-0.34		0.29		-0.39		0.34		0.24		-0.42	

As regards the males, these figures indicate an association between the mortality (35-45) and excess of females in the group 15-20, this correlation being more marked than that in the case of the 25-35 males. The point referred to in connexion with the figures of (6B) and (7B) is also to be noted in those of (8B)—viz., an association between

the female mortality and excess of females in the 15-20 group. On the whole, the results given throughout this section show a fair agreement between the two independent samples dealt with. The figures showing the correlations referring to populations in the individual age-groups are not large, and are not so satisfactory for the purpose of drawing inferences as are those in section 11.

In the same way as we have considered the association between mortality of males (females) and excess of females (males) in particular age-groups, we could also investigate that between mortality of males (females) in one age-group and excess of males (females) in one other particular age-group. This would involve a fair amount of extra work¹ which the experience derived through working the correlations in this section suggests would not throw much additional illumination on the problem, and I have not had time to complete it for this paper.²

(13) At the expense of some reiteration, it will be convenient to sum up shortly the chief conclusions drawn from the many results given throughout the paper. Many of the correlations arrived at through varying the size of the population in single age-groups only are too small to be helpful in this connexion, and it is chiefly by the

¹ It would, for example, require such a correlation as $M_1, M_3+M_4 r_{M_2m_1}$, and would thus bring in a number of new variables obtained by taking *two* age-groups (both for males and females) together in every possible way.

² It is instructive to compare some of the correlations found for phthisis with the corresponding ones for deaths from all causes other than phthisis. A few of these latter have been worked out for the best sample—that from Wales—and the comparison is :—

	$M_1 r_{F_1m_1}$	$M_2 r_{F_2m_2}$	$M_3 r_{F_3m_3}$	$M_1 r_{F_2m_1}$	$M_1 r_{F_3m_1}$	$M_2 r_{F_1m_2}$	$M_2 r_{F_3m_2}$	$M_3 r_{F_1m_3}$	$M_3 r_{F_2m_3}$
m denotes phthisis deaths	0.73	0.76	0.76	0.66	0.58	0.75	0.73	0.77	0.75
m denotes all other deaths	0.20	0.32	0.01	0.35	0.28	0.30	0.36	0.00	0.09

The mean of the correlations for phthisis is 0.72 and for all other deaths 0.21. Although no single one of the values in the lower row is certainly significant, there is a suggestion that some slight relationship exists between excess of females and deaths of males from all causes other than phthisis. But this association is not comparable in magnitude with that holding in the case of phthisis. It will probably be well, if the work is ever repeated on more satisfactory samples, to show throughout the two sets of correlations used in this footnote. The nine given here indicate that phthisis stands on a different footing from other diseases with regard to sex-ratio of the population. It may be of use to state here, also, that the correlations between the number of male deaths from phthisis and from all other diseases for constant number of males in the age-groups 15-20, 20-25, and 25-35 in turn, are 0.27, 0.36, and 0.01 respectively, so that, in the Welsh sample, there is little evidence that the districts of heavy male phthisis mortality were those of heavy mortality from other causes.

cumulative effect produced when combining such age-groups that correlations are found of sufficient magnitude to warrant definite inferences. In drawing these inferences, I have in certain cases given more weight to the figures derived from the Welsh data than from the others. I believe the Welsh sample to give a far more homogeneous series of districts than do those drawn from the South of England, and had I time to deal with a further sample, I should without hesitation take that referring to the same Welsh districts, but for a different decennium. The conclusions are:—

(i) *With regard to the Phthisis Mortality of Males.*—There is definite evidence that the mortality of young males (15-25) is associated with excess of females and even of older females [(1A), (2A), (5A), (6A)]. That of older males (25-45) is associated with excess of younger females, certainly up to age 20 and probably beyond [(3A), (4A), (7A), and (8A)]. That of young males (15-20) is certainly not associated with excess of older males [1(c)]. That of males between 20 and 25, and again between 25 and 35, is associated with excess of males in combined age-groups in which the younger ages have most weight [(2c) and (3c)]. There is just a hint that the mortality of males (35-45) is associated with excess of males (15-20), but not with similar excesses in other groups [(4c)].

(ii) *With regard to the Phthisis Mortality of Females.*—There is little evidence that the mortality of any age-group is associated with excess of males [(1B) to (8B)]. There is a suggestion, however, from the Wales sample that that of the (20-25) age-group and also the (25-35) one is associated with excess of males in the young age-groups [(2B), (3B), (6B), (7B)]. That of young females (15-20) is not associated with excess of females in other groups [(1c)]. That of age-groups (20-25) and (25-35) is moderately associated with excess of females in combined age-groups in which the (15-20) population predominates—[(2c) and (3c)]. That of the (35-45) group is not associated with excess of younger females [(4c)].

(14) I now propose to discuss the bearing of the conclusions above upon the factors referred to in sections (8) and (9), which might be expected to have assisted in producing the correlations noted. The new facts which must be taken into account in addition to those made use of in sections (8) and (9) are that association exists between the phthisis mortality of (a) males and excess of younger males, and (b) females and excess of younger females. The argument that occupation has been potent in producing the associations has therefore to show not only that

males generally are employed in "phthisical occupations" in districts in which females are in excess, but also (a) that older males are employed in those occupations in districts in which younger males are in excess, and (b) that in some way the older females suffer more in districts in which younger females are in excess, and this latter can hardly be produced through occupation. Alternatively, it has to show not only that males are employed in "non-phthisical occupations" in those districts in which they are in excess, but also (a) that older males are employed in those occupations more in districts in which they are relatively in excess of young males than otherwise, and (b) that in some manner the older females suffer less in districts in which they are relatively in excess of young females. It is difficult to see how these three facts can all be accounted for in the same sample. In the case of the Welsh sample I have studied carefully the details given of occupation for each district, but have been able to discover no general feature which might be expected to produce the association found in sections (11) and (12).¹ I have satisfied myself that these associations are to a large extent independent of occupation. It is a feature significant of note in the light of the facts brought out in this paper that the two large industries of coal-mining and agriculture, in which the phthisis mortality is low, operate in localities in which scarcity of females is very marked.

Concerning the other factors mentioned in section (8) little more need be said. The presence of reputed health resorts, emigration and differential mortality might have assisted to a small extent in producing some of the associations—those shown in (1A) to (4A), for example—but could hardly at the same time have created the others—those in (2c) and (3c). On the whole, though the populations dealt with are far from being the "ideal" cohorts referred to in section (3), the extraneous factors producing deviations from the ideal appear to be distributed at random. I do not assert that this is universally true, but the result of this first investigation covering only a very limited field suggests such a conclusion.

¹ Among other inquiries in this connexion I have found the correlation between the number of females (over 20) and the number of males "working in minerals" for a constant total number of males (over 20), and again, the corresponding correlation for those "working in agriculture." The former is + 0.18 and the latter + 0.19—neither being significant. We need not discuss whether those working in these two particular industries are more or less prone to phthisis than are adult males in general. Without being certain proof, these correlations are fairly substantial evidence that the association between high male phthisis mortality and excess of females in the Welsh sample is not produced by differences in the proportions in the two chief occupations.

On the question of the general trustworthiness of the data employed the results obtained do not appear to me to cast doubt. It is not suggested that the data are without imperfections, but rather that, within each sample, those imperfections are distributed in a chance manner, and therefore do not affect conclusions reached by the method of correlation. It should not be overlooked that the effect of faulty data must be much more to hide correlation where such actually exists than to create correlation where it does not exist.

(15) In closing this paper I feel that although I started out with a definite idea I cannot finish with a statement of how my results accord with that idea. The essence of my work is to point out that phthisis is most prevalent among males in districts in which females are relatively most abundant, and also, again, that it is most prevalent in populations 20-35 in those districts in which the population 15-20 is relatively largest. I have examined certain factors which might be expected to produce the correlations shown, but I have not been able to discover proof that any of those factors are the cause of the associations. Medical men may be able to suggest reasons for what I have found quite apart from my original idea. Mr. Greenwood, to whom I am greatly indebted for reading and criticizing this paper when in MS, suggests, for instance, that the effect of pregnancy in lighting up latent phthisis may have helped.¹ All I feel justified in doing is to draw attention to my results, and to ask for criticisms and suggestions concerning them. If no other adequate explanations are forthcoming I think that personal communicability must, in some way, be put down as the cause. In the light of the views of many authorities that infection occurs chiefly in the early years of life, and that it is certain other conditions, acting possibly long after the infection, which cause collapse in adult life, it is difficult for a layman to perceive the *modus operandi* by which infection can occur in accordance with the idea pictured in this paper. This, however, does not prohibit the use of the hypothesis on which my work has been based, and that hypothesis may be made the foundation for other investigations on much wider bases. Even if the conclusions of this paper are ultimately explained by other means, my work will, I hope, serve a useful purpose in drawing attention to the mass of statistical data available on the subject of phthisis, and to the necessity for thorough analysis of

¹ This would require an inquiry into the question of the possible correlation between the marriage- and birth-rates and the sex-ratio of the population between 15 and 45.

those data. Material is in existence to allow one to scrutinize far more thoroughly than has yet been done the relationship of phthisis to factors such as general environment and degree of institutional segregation. Moreover, it is chiefly through working on some problem that ideas for others are suggested, and much of the best research has been not that which adhered closely to some original intention, but that which went off on a side issue brought out in the course of investigation. "Not through eastern windows only, when daylight comes, comes in the light."

Tuberculosis Statistics : Some Difficulties in the Presentation of Facts bearing on the Tuberculosis Problem in a Suitable Form for Statistical Purposes.

By HILDA CLARK, M.B.

THE necessity for statistical research in matters where direct experiment cannot be arranged under strict scientific conditions need not be emphasized to this audience. There are, it is true, some scientific discoveries which have been made through the insight of a master mind who could separate the essential from the accidental in the cases under his own observation and draw deductions that time and further research have verified. Such a thinker may also use the carefully recorded observations of others for his inspiration, or for the confirmation of his suspicions. But where this fails, and where the conditions of exact scientific observation and experiment are lacking, we have recourse to the statistical method, that is, to the consideration of series of cases with regard to certain facts, and to a comparison of one series with another in order to establish the relations of different sets of facts to each other. In this way it is possible to obtain conditions approaching those of scientific observation and experiment in the laboratory. We can eliminate to some extent the personal equation of the observer, the accidental relation of one fact to another, and the coincidence of other disturbing factors. The value of this method depends first on the accuracy with which the facts can be observed ; second, on the extent to which they can be isolated from other factors, including the possibility of isolating and recording control cases, and, thirdly, on the possibility of describing and defining the set or class of people or conditions from

which the facts have been collected. While it is obvious that common sense must be used as to what facts are likely to be of value, and that science will progress faster if the more important ones are investigated first, it is well to remember that some facts prove useful later that did not suggest much promise at the time. Thus it would be an advantage to those who wish to know what provision to make for treatment by artificial pneumothorax if they knew in what proportion of cases serious mischief in one lung is accompanied for an appreciable length of time by little or no infiltration of the other.

I am not qualified to deal with the whole statistical question of the estimation of figures connected with tuberculosis, but I think it may be of value to consider to what extent those of us who have been engaged in practical tuberculosis work can prepare records suitable for statistical expression and deductions, and to ask for suggestions as to how the difficulties which arise may be overcome. The material which I propose to consider chiefly is that which comes under observation in a modern tuberculosis scheme where all available preventive and curative measures are co-ordinated round a dispensary for diagnosis and specific treatment.

It is necessary first to review briefly the essential features of the clinical problem before us. Tuberculosis is a chronic disease of which neither the beginning nor the end has been accurately defined. The causal organism is so widespread that practically the whole population has the opportunity for contracting it. So many people who harbour the bacillus and are infective to others are in comparatively good health that compulsory isolation of all infective cases would inevitably lead to concealment and so defeat its own object, and we are obliged to contrive a less drastic and more complicated plan of eliminating the sources of infection. The onset and course of tuberculosis, depending, as in most bacterial infections, on a varying relation between the virulence of the bacteria and the specific protective mechanism of the host, is more varied than that of any other infectious disease known, and appears to depend more on variations in the protective mechanism than on those in the infecting organism, though it is held that the latter is also important and that there is a definite difference between the human and bovine types. The protective mechanism depends not only on innate qualities but also on constantly changing conditions in the body, and thus is profoundly affected by the environment, by all that affects the general nutrition of the body, including mental and emotional factors, and by the accidental presence of other bacteria. This variation in the course of the disease and the extent to which chronic forms occur has

not been recognized until recently. It is possible that the chronic and less active forms are more common now than in days when the death-rate was higher. We are not yet in a position to estimate their importance or the part they play in the causation of chronic ill-health, in the mortality from other diseases, in spreading infection, as the precursors of fatal outbreaks of active tubercle, or in stimulating the production of any effective degree of immunity to tuberculosis. The investigation of these points is both urgently needed and peculiarly difficult, as I will show later.

The irregular course of the typical case of fatal phthisis must also be noted. Whether treated or untreated, alternating improvements and relapses are generally observed, and it is difficult to say in any individual case at the onset of serious symptoms whether life will last a month or several years. This variation is probably due to the effect of environment (in the broad sense of the word) on the protective mechanism, and it introduces a great difficulty in estimating the effects of any line of treatment. Some cases, however, show a steady downward course from the onset, and if a means could be found of ascertaining whether a case belonged to this type before the disease became hopelessly advanced there would be evidence in favour of a method of treatment which was followed by improvement in such a case.

This brings us back to the difficulty of diagnosis, one which opposes us at every attempt to obtain valuable statistics and which must itself, until the laboratory can solve it, be tackled by the statistical method. The position is that the only universally accepted proof of infection having taken place is the demonstration of the tubercle bacillus, either by direct examination or, indirectly, by injection of the suspected material into a guinea-pig. It is, however, generally agreed that the occurrence of a reaction after the injection of tuberculin indicates that the subject has previously been infected by tuberculosis, though it is held by many that this reaction still occurs when the lesion is healed.

There is no method known of proving that an individual has been completely cured of tuberculosis. Further observation is needed to show whether a reaction can occur in the subject of a completely healed focus, but if tuberculin has been used for treatment it cannot be used to prove the completion of cure, since it is well known that complete tolerance to tuberculin may be established without cure. Even the failure to obtain a focal reaction cannot at present be used in this way, since it may be absent, or unrecognizable, in cases where there are other signs to show activity. Since there is no universally accepted criterion

of the activity of a focus or of the resisting power of a patient, the decision as to the type and prognosis of a case is always a matter of personal opinion. In order to obtain statistical evidence that may overcome this difficulty, careful classification must be adopted.

It has already been laid down by all observers that for statistical purposes cases must be divided into two classes: those with tubercle bacilli in the sputum and those without. A practical difficulty arises here in comparing dispensary cases with those at a sanatorium, since it is far less easy in the former to obtain a good specimen of sputum. Two series of cases can only be compared if equal time and care have been given to the sputum examination in each. Attention must also be called to the question of whether the fact that a patient expectorates tubercle bacilli—i.e., is “open”—is for that reason in a more serious condition than one who does not, or whether the higher mortality among the former is solely due to the fact that the latter include cases of mistaken diagnosis. This is important, in view of the observation made by several workers that in dispensary practice the bacilli are often detected after a reaction when they had not been discovered before. Unfortunately in many cases too little time had been expended on the previous examination to make it certain that bacilli had never been present.

People often speak as though the only cases that should be used for statistical purposes are those in which tubercle bacilli can be demonstrated, and it is also claimed that the statistical estimation of these is an easy matter. Neither statement is true, for, although the difficulties are greater in the former case, they are not insurmountable, and the most careful analysis and classification are also needed before valid conclusions can be drawn from the latter.

The investigation of cases in what may be termed the “pre-bacillary” stage is of urgent importance, and must be carried out mainly by the statistical method. It must not be forgotten that all fatal cases of phthisis, all cases infective to others, pass through this stage, so that to ignore it is as obstructive to further progress as it would be to ignore the incubation period of small-pox and wait till the symptoms develop before vaccinating. Some information as to this phase is obtained from post-mortem records. These must be used carefully, since it is difficult to express their relationship to the community as a whole. Post-mortems are rarely done on people whose health and illness record can be ascertained in detail, and therefore throw little light on the extent to which chronic lesions cause symptoms. Records of tuberculin tests

applied to a complete and definable class are of course valuable, but only to a limited degree if such observations cannot be compared with records of past and subsequent history, both of those who react and those who do not.

What is chiefly needed in order that pertinent facts may be obtained is the observation over as long a period of life as possible of cases of chronic ill-health, the careful classification of facts thus observed, and the statistical comparison and correlation of all series of facts that could bear on the question. Much experience outside dispensary work may be utilized for this, such as that of general practitioners working among a similar class of society, and records of charitable organizations, who often follow cases up for years through the hands of varying doctors and institutions.

The records of medical inspection of school children will provide a basis of figures referring to a whole definable class, with which figures concerning selected members may be compared. It must be remembered, however, that it is useless to compare a set of children examined by one standard with a set examined by another, and the standard adopted must be clearly described. Thus school children are examined by a standard which can be applied in from two to five minutes, while the apparently healthy children from a house where a case of tuberculosis has occurred are examined at a dispensary by a standard which takes a quarter to half an hour. There may be a considerable difference between the conditions considered tubercular by those who use the tuberculin test and those who do not. It is not always possible to secure the complete examination of the whole family of an infective case, and the reasons why some members can be brought and not others are very varied, so that the selection of those to be examined is not uniform.

A consideration of the history of the length of symptoms that a patient gives may throw some light on the pre-bacillary stage, but unless it can be confirmed by other evidence it is of limited value as regards conclusions concerning the pathological condition. It is, however, perfectly valid for showing at what stage of the disease it might be possible to persuade the majority of cases to apply for diagnosis and treatment. The difficulty in drawing conclusions as to the effect of treatment at this stage is so great that some people appear to think it is hardly worth while to treat. Since it is only at this stage that treatment can result in complete cure without destruction of lung tissue and can prevent the case from being infective to others, it is particularly

important to settle the question as to what methods are the most effective. Now in judging this it is necessary to consider the whole number of these cases and not only those who are willing to follow the doctor's advice. A method which patients can readily undergo and which can readily be provided will be more successful than a more complicated one. The final criterion of success for practical purposes is the extent to which the incidence of active tubercle can be lowered, and in selecting methods likely to attain to this we must estimate the percentage of cases that will be unable to avail themselves of each, as well as the percentage of those submitting to it in which it is likely to be successful.

Thus sanatorium treatment must include among its failures those early cases who refuse to leave home and work until the diagnosis is certain, and who are then too advanced for cure.

Tuberculin treatment must include among its failures those who are too stupid or too careless to attend at regular intervals, or who deliberately falsify their temperatures. Thus treatment must always be considered from two points of view, first its effect on those who are willing and able to do what they are told, second its applicability to the social conditions of those needing it. The two aspects cannot always be separated, but the attempt must be made by careful classification of the facts observed with this in mind, and statistical evidence as to the effect of a particular method of treatment in relation to the environment can be obtained, even in the pre-bacillary stage, if a long series can be observed in this way over a long enough period. The statistics thus obtained are comparable to those of the value of vaccination, and it must be remembered that while a certain proportion of a given series would remain well without treatment, if a higher proportion is found to do so when treatment is given it may be taken as proof that such treatment has been effective.

Turning to the cases in whose sputum tubercle bacilli are found, we may obtain some information as to the type through the investigation of death certificates and of notified cases. Even the figures drawn from death certificates are, however, dependent to a considerable extent on the personal equation of the doctor, since they are rarely confirmed by post-mortem examinations, and the examination of the sputum is frequently omitted. With regard to tuberculosis in infancy, such figures are particularly fallacious, and the recent developments of tuberculosis work, in diagnosing as tubercular many cases whose death would otherwise have been ascribed to bronchitis, &c., and in showing some cases of syphilis, malignant disease, and other conditions, to be non-tubercular,

have introduced a difficulty in comparing rates of different years or different localities. Still more are records drawn from notifications affected by the personal judgment of different doctors, and even if all the cases notified could be checked by a central authority their value for many purposes would be limited by the fact that it would be impossible to examine clinically the patients from whom they are selected.

It has come to be recognized that there is a type of pulmonary tuberculosis in which, although tubercle bacilli may be found in the sputum, the patient maintains such good health that he is in a very similar condition to the typhoid or diphtheria "carrier." We have at present no means of estimating the nature of the immunity that might account for this. It is clear that if such a case should suffer from a complication the diagnosis of which was masked by the presence of tubercle bacilli, an error would be introduced into the classification. To avoid this it would be necessary to keep patients under prolonged observation before classification, without using any treatment. This is not always possible in dispensary practice, where there is too much risk to the patient if time is lost.

As an example of the necessity for both analysing observations and considering a sufficient number before drawing conclusions, I may quote my own records, which show that even out of so long a series of cases examined as 1,400 it happens that nearly all whose names begin with J were unsatisfactory to treat. This might have been thought suspicious had it referred to an occupation or a locality, instead of to a letter, but the suspicion would have been removed by a closer analysis, as this shows a sufficient variety in the reasons for difficulty in treatment to suggest coincidence rather than causal relation.

I have already referred to the importance of environment in its effect on the incidence and course of the disease. Since we have no method of treatment that even claims to be both certain and rapid in action, those in general use acting through gradual stimulation of the specific protective mechanism of the patient, it is clear that environment must also have an important influence on the success of treatment. Hitherto it has only been considered in its broadest aspects, and it has not been followed up in the minute way that it deserves. The difficulty lies in the interaction of cause and effect, and is increased by a tendency to regard one effect and ignore another. This may lead to the most erroneous conclusions. For instance, a larger proportion of cases from poor homes improve under treatment than is found among patients who

are well off, but it is not justifiable to conclude from this that poverty has a stimulating effect on the resisting power. Such a fallacy is checked at once by remembering that the death-rate from phthisis is far higher among poor people than among rich. The environment must be considered in relation to almost every factor that is required for statistical purposes. Under this heading may be included a large number of the difficulties that beset the accurate record of facts at a dispensary. It affects the type of applicant that is attracted. Thus if there is indiscriminate provision of food and clothing the poorest are attracted and the self-respecting are kept away. Under a lax administration the proportion of "ne'er-do-weel's" who wander from one hospital to another increases. Hard-working married men and women will only apply for diagnosis at an early stage if hours are appointed to suit them, and they are less likely to do so if the only treatment offered them involves giving up work.

Many patients of slight ill-health present themselves at tuberculin dispensaries for the treatment which has relieved their friends of similar symptoms, though they would not have dreamed of applying at a centre for diagnosis only. Varied circumstances affect the patients throughout their attendance at a dispensary, and may affect the results of treatment employed. Some may appear to live under suitable conditions for ambulant treatment at first, but later are prevented from following the precise course laid out. One has a sick child, another loses his job, another becomes pregnant, another catches influenza, yet another has a letter for a sanatorium offered him, and though he appears to have recovered satisfactorily without, he must not be dissuaded from receiving the added security against relapse that a month or two in a sanatorium might give. To disentangle and analyse these conflicting elements is a serious problem in the routine of a busy dispensary. It is often difficult to tell exactly what the decisive factor has been. For instance, a patient has been treated with tuberculin for a time and then gets a severe reaction which interferes with work next day, making him think he is worse and refuse to attend again. A week or two later the nurse visits and is told that he does not need to go on with treatment because he is quite well. How is he to be classified?

There are many points in connexion with the course of tuberculin treatment in different types of cases that are very difficult to investigate at a dispensary. More knowledge is needed first of the course of similar methods in patients whose environment is under better observation and control, but since an important feature of tuberculin treatment is the

fact that it can be given in certain cases without interfering with home life and work, it is necessary to study the complicated relationships of sensitiveness, type of disease and environment under these conditions. As in the other difficulties to which I have referred, careful observation, analysis and classification, with scientific methods of correlating the series of facts thus recorded, may be expected to lead us to a better comprehension of the problem.

DISCUSSION.

The PRESIDENT (Dr. W. H. Hamer) said they had now before them two very interesting papers which should stimulate discussion. With regard to the former, he would like to point out that Dr. Snow's method had imposed upon him certain limitations, and in fact had not enabled him to do much justice to the question of migration. In the first place, he had practically limited consideration to rural areas. Their interest in migration started, however, from the demonstration of the attraction exerted by the towns upon particular sections of the rural population, and if urban areas were excluded the opportunity of studying migration was largely lost. In Table I Ongar and Cardigan stood out as the two extreme instances—Cardigan had been deprived of some of the best of its young men, who had gone to the Glamorganshire mines; Ongar has especially lost young girls who had gone to domestic service in London. Dr. Snow agreed that the young men who had left Cardigan were probably "constitutionally less prone to phthisis," but, he argued, in that case, the Ongar girls leaving for London must also have been the pick of the countryside, and this view, he urged, was not consistent with the low phthisis-rate of females left in Ongar. But it did not necessarily follow that domestic service was as severely selective as was the mining industry. In confirmation of this way of looking at the matter it might be pointed out that if districts were taken in which an excess of females has been brought about by occupational attractions—straw-plaiting districts, such as Hitchin, Hemel Hempstead, Berkhamsted, and Luton, or a woollen clothing district like Melksham, or a glove district like Yeovil—it would be found that the male phthisis-rates were now not high, as they should be on Dr. Snow's hypothesis of influence exerted by excess of females, but quite low. Then, in the second place, Dr. Snow (after his first two tables) dwelt with sex-ratios; and this was a very serious matter from a migration point of view. With Dr. Snow, excess of males (females) did not mean that there are more men (or women) than in a mean population; indeed, with so-called excess of males there might be far fewer men and with so-called excess of females far fewer women than in the country as a whole. A rural area might have been bled white of its young people of both sexes, but provided the greatly reduced number of lads exceeded that of the girls by *one*, there was said to be an excess of males. It is just as if in dealing with heaps

of coins, regard were paid to the ratio of those with heads of Queen Victoria to those with heads of King Edward or King George, rather than to the actual values of the coins. They were constantly being urged by Mr. Major Greenwood to study statistical methods, but how were they to reply, say, to their milkman whom they had paid by week on Dr. Snow's principles, and who disputed the correctness of the amounts handed over in discharge of his bills, insisting that he had been given too much copper and too little gold and silver, and declaring that he would not accept the evidence furnished by the sex-ratios? Presumably, Mr. Greenwood would advise them to tell the milkman that he had no right to further discuss the matter until he had made a really serious attempt to study the method of "partial correlation"; yet, after all, perhaps there was something in the milkman's point of view. A further question to be borne in mind is the tendency of women emigrants to return when ill to their own homes to a far greater extent than is the case with men. Again, it needs to be remembered that the death of an emigrant may not occur until years after emigration. Once more, the "ideal populations" of Dr. Snow have unquestionably lost most important elements, in spite of the fact that the occupation statistics of the residual populations in the rural areas cited by Dr. Snow present no striking contrasts. It is the occupations of those who have gone, not of those who remain, that we should like to know about.

Finally, migration was declared by Dr. Snow to be a "purely hypothetical explanation," while on the other hand he said "nobody competent to express an opinion at the present day appears to doubt the possibility of personal infection." Why, it may be asked, regard one explanation as more hypothetical than the other? Indeed, if we look into the matter further the existence of infectivity (as Dr. Newsholme has told us) did not become an accepted doctrine until it had been demonstrated by actual experiments on animals. The case for infection rests upon laboratory inoculation, feeding, &c., not upon any direct evidence—husband and wife, attendants in hospitals, &c.—that in fact is all against it. Personal infectivity really is the "hypothetical explanation"—migration stands on quite a different footing. No one contends that there are great differences in the proportion of males and females born in different parts of the country, and Dr. Snow says differential death-rates in the two sexes play no considerable rôle. Far from being merely "hypothetical," migration actually holds the field.

With regard to the reading of Dr. Hilda Clark's paper, he (Dr. Hamer) would like to note that it marked a new departure in the history of the Section. The poet Dante when he was intent upon praising the Lady Beatrice expressed the hope that he might be able to "say that of her which hath never yet been said of woman." They were all in a position that evening to say this of Dr. Hilda Clark, inasmuch as she had read a paper before the Section. He would call upon Mr. Major Greenwood to open the discussion.

Mr. MAJOR GREENWOOD jun., remarked that he obeyed the President's command to open the debate with some hesitation because he (Mr. Greenwood) had seen Dr. Snow's paper in manuscript and the suggestions and criticisms

he had then made were already noticed by the author. With respect to the method employed by Dr. Snow, he confessed himself unable to grasp the exact point of the President's allegory. Dr. Snow was dealing with the coincident variations of the numbers of persons in one age-class and deaths in another age-class, the numbers of persons in the latter age-class being maintained constant. Turning to the nature of the material, it was to be remembered that the absolute accuracy of the records was not of the essence of the matter; it was sufficient for Dr. Snow's purpose if the standard, high or low, were approximately the same in all the districts brought under notice. It might be worth noting incidentally that Dr. Hilda Clark's valuable communication must tend to confirm the scepticism of those who, like himself, were left cold by the statistical "proofs" cited in favour of the wonder-working effect of tuberculin treatment.

Passing to the subject-matter of Dr. Snow's paper, he desired to express his concurrence with the President in the latter's belief that migration had been an important factor in the production of Dr. Snow's results. It appeared to him (Mr. Greenwood) that certain of Dr. Snow's correlations were at least consistent with such a belief. As an illustration he would take Table Ic. It appeared that in what Dr. Snow regarded as the most reliable series of districts the correlation between the number of males at a higher age-group and the phthisis deaths in the first age-group for a constant number of males in that group was large and negative, almost of the same order as the cross-correlations to which Dr. Snow attached special importance. Apart from the explanation tendered by Dr. Snow in the paragraph following the table, it was interesting to remark that such negative correlation would necessarily be produced were selective emigration to be taking place. Thus, if a high rate of phthisis mortality at ages 15-20 be taken as a measure of "unhealthiness," then the direct effect of this upon the numbers living in the next age-group—i.e., the continuance of an unfavourable rate of mortality and consequent diminution in the numbers living—would be intensified, perhaps greatly intensified, by emigration of healthy males. This consideration seemed to him of great importance, but it was only right to draw attention to the correlations given by Dr. Snow in the footnote to section (12). Were the correlation of male phthisis deaths with excess of females solely produced by selective migration, one would expect to find results of the same order when, for phthisis, all other causes of death at the given ages were substituted. That such was not the case seemed to him an argument of weight in support of Dr. Snow's contention and also to have a bearing on the suggestion noticed in section (8) (iv), due to Mr. G. Udny Yule, that owing to the differential mortality of the sexes and the inequality of the sex-ratio at birth, female excess was a measure of unhealthiness.¹ If, however,

¹ A point for consideration in estimating the importance of the correlations with deaths from other causes as a check on the influence of migration in producing the phthisis results is whether such deaths do or do not depend mainly on fortuitous cause groups—i.e., causes the effects of which do not measure the constitutional fitness of the population at risk.—M. G.

one hesitated, and he did hesitate, to put on one side migration as a principal factor (Dr. Snow himself had, of course, very fairly and distinctly indicated the possible importance of migration and could not be accused of neglecting it), it also followed that occupational differences needed to be considered with attention. It was, he thought, impossible to regard Dr. Snow's analysis of this cause-group as satisfactory, a circumstance in no sense reflecting upon Dr. Snow's skill and acumen, but due to the somewhat unsatisfactory classifications available. Even the data which were available, however, indicated enormous occupational heterogeneity. This would be noticed in the tables of section (5) and section (9). Here again the point had not escaped Dr. Snow's attention and the important footnote to section (14) was *prima facie* evidence that occupational heterogeneity was not a complete explanation of the results. He would add that the influence of occupation was, in his view (excluding the relatively small number of occupations in which the nature of the work involved immediate risk of injury to the susceptible tissues), part and parcel of the factor involved in migration—viz., the probability that differences of occupation were correlated with differences of constitutional type.

With respect to the suggestion made by Dr. Snow that the results might be explained by supposing a greater communicability of disease from females to males than from males to females, it seemed to him (Mr. Greenwood) very difficult to reconcile such an hypothesis with the facts at present known respecting the epidemiology and pathology of phthisis. It was also to be observed that Dr. Snow's data consisted of phthisis *deaths* and that, since infection must have occurred some time, in many cases a considerable time, before death, and since it was admitted by everyone that a good deal of migration was taking place and that the sex proportions were very different in the various districts, it followed that the data might not give at all an accurate picture of the conditions prevailing at the time when the infections were produced. In other words, if the term "infection" were used in a strict sense it would be necessary, in order to test Dr. Snow's hypothesis, to collect data other than those furnished by the Registrar-General. The only escape from this difficulty, which so far as concerned the infection hypothesis seemed to him fundamental, was afforded by supposing that infection preceded death by only a few months. So far as primary infections were concerned no one would believe this, and even if one held that the genesis of active disease depended upon a secondary massive infection, then the ordinary clinical course of phthisis showed that the average interval was to be measured by something well over a year.

In conclusion, he wished to congratulate Dr. Snow, whose paper displayed not only analytical skill but a caution in stating conclusions and a candour in recognizing difficulties and objections which should be widely imitated by students of the subject.

Professor KARL PEARSON, F.R.S., and Dr. DAVID HERON: It is needless to say that Dr. Snow's paper gives evidence of a very great deal of most painstaking arithmetical work, and raises many interesting points. But the secondary title of his paper, "A Statistical Investigation having Bearing upon the Question of Personal Communicability," certainly suggests that he considers infectivity to be somehow related to the phenomena recorded by him. The essence of his work appears to be stated in section (15), p. 54: it is, "To point out that phthisis is most prevalent among males in districts in which females are relatively most abundant." A second conclusion we shall not at present consider, partly because of the limited time at our disposal in which to analyse Dr. Snow's material, and partly because, if we accept his selection of districts,¹ we are not able to interpret consistently the immense number of partial correlations tabled by him. For example, we do not see why stress should be laid on $M_2r_{M_1m_2} = 0.60$, on p. 44, and not on $M_1r_{M_2m_1} = -0.58$, on p. 43, both being of the same order. Without having fully entered into the matter, we doubt whether much trust can be placed in selected series of thirty to forty districts only. This arises not only from the fact that they are selected²—and no very cogent arguments for the selection are given—but because the constituent correlations and the probable errors of both total and partial correlations are never stated by Dr. Snow. These probable errors are such that the tabulated values may differ by quite as much as 0.2 from the true values. Add to this that the omission of one or two extreme districts with anomalous disturbing influences may lower Dr. Snow's correlations of 0.6 to 0.4, and his correlations of 0.4 to 0.2,³ and we see how difficult it is with small

¹ Dr. Snow takes only about three-fifths of the available districts in the series given in his Tables III, IVa, and V. He states his grounds for selection, but we do not feel wholly happy about them, and we have by no means exhausted the list of retained districts in which we know anomalous conditions exist. For example, Stoke Damerel, besides the dockyard hands, at the 1861 census had a sex-ratio of 179 (ages 20-25) because it included the crews of seven warships numbering several thousand men, who naturally contributed but little to the local phthisis rate.

² Dr. Snow omits fifteen of the forty-five Welsh districts, and the correlation of the male phthisis death-rate (15-20 years) and the sex-ratio (15-20 years) is for the thirty selected districts, -0.68 ± 0.07 . But in the fifteen districts rejected by Dr. Snow it is -0.30 ± 0.16 , a result not in itself significant.

³ Take Dr. Snow's Table V; the correlation, as it stands, is -0.28 , but if we reject Stoke Damerel with its 46 per cent. of males engaged in defence (Devonport Dockyard) and its low domestic-servant rate, together with Salisbury with its high domestic servant rate, the correlation becomes -0.16 ± 0.12 , which is non-significant. Again, if in Dr. Snow's Table I the extremes, Christchurch and Cardigan, be left out, the correlation of the sex-ratio (15-20) and the phthisis death-rate males (15-20) drops from -0.67 to -0.44 . Yet Cardigan is certainly an anomalous district, referred to even in popular encyclopædias as having an enormous preponderance of females, owing to the mining emigration to Glamorganshire and elsewhere, and Christchurch contained the developing watering-place, Bournemouth, with a high percentage of domestic servants, and a high phthisis death-rate owing to the inclusion of the National Sanatorium, founded in 1855, and contributing largely during the period in question to the deaths from phthisis in the Christchurch total. Eastbourne, with its lodging-houses and convalescent homes, is another case in point.

groups of selected districts to fully appreciate a mass of by no means consistent partial correlation coefficients. We think that, with thirty to forty *selected* districts, there is very great danger of individual districts with anomalous conditions influencing widely the correlations. The two chief factors are the influx of domestic servants into residential towns and the outflow of males from agricultural or seaboard districts to seek employment in mines or at sea. If we take the classes, general servant, housekeeper, cook, nurse (other than hospital nurse), and housemaid, we find residential towns like Exeter and Salisbury with 14·4 per cent. and 12·5 per cent. of the female population engaged in domestic service, while in a district like Cricklade the percentage is only 6·2. Roughly the sex-ratio (15-20) is correlated about -0·4 with the percentage of domestic servants in the English south-western districts dealt with by Dr. Snow. But a still more influential factor in modifying the sex-ratio is the migration of males, especially young males. Dr. Snow dismisses the explanation that his results are merely due to migration—i.e., the exit of healthy males from one district, leaving there a low sex-ratio and a higher phthisis mortality¹ to be calculated on a lower male population, to a second district which will now have a high sex-ratio and a lower phthisis-rate—as “pure opinion” and as a “purely hypothetical explanation,” for “no statistical material on the point exists.” We think some evidence could have been found had he looked further, even in charts of the male and female populations for each age. In Chart I we show the male and female populations of the whole of Wales and Monmouth. We see that, as a whole, the total numbers of the two sexes are at each age very close to each other. Obviously the phenomenon we have to deal with is largely a transfer of population inside the Principality. Next, examining Chart II, we see the influx of girls and young women into Exeter, seeking employment; there is no obvious exit of boys and young men. Chart III shows the enormous influx of boys (15-20), and young male adults (20-25) seeking employment in Devonport Dockyard. It is not till after age 40 that the proportion of the sexes begins to right itself and shows a final considerable balance of females. Chart IV shows a mining district with a marked influx of young males. Pontypridd is one of the districts excluded by Dr. Snow, but it shows the mining immigration well. Charts V and VI, for Cardigan and Aberayron, indicate emigration of young males. If Charts III to VI be compared with Chart I, we appreciate how local is the phenomenon we have to deal with—it is a phenomenon of *outworking* rather than of emigration, the drifting of healthy males to districts where work is available, and the consequent disturbance of local sex-ratios. We do not believe that local sex-ratios are really of any indicative value until the nature of the economic conditions in the locality has been fully studied.

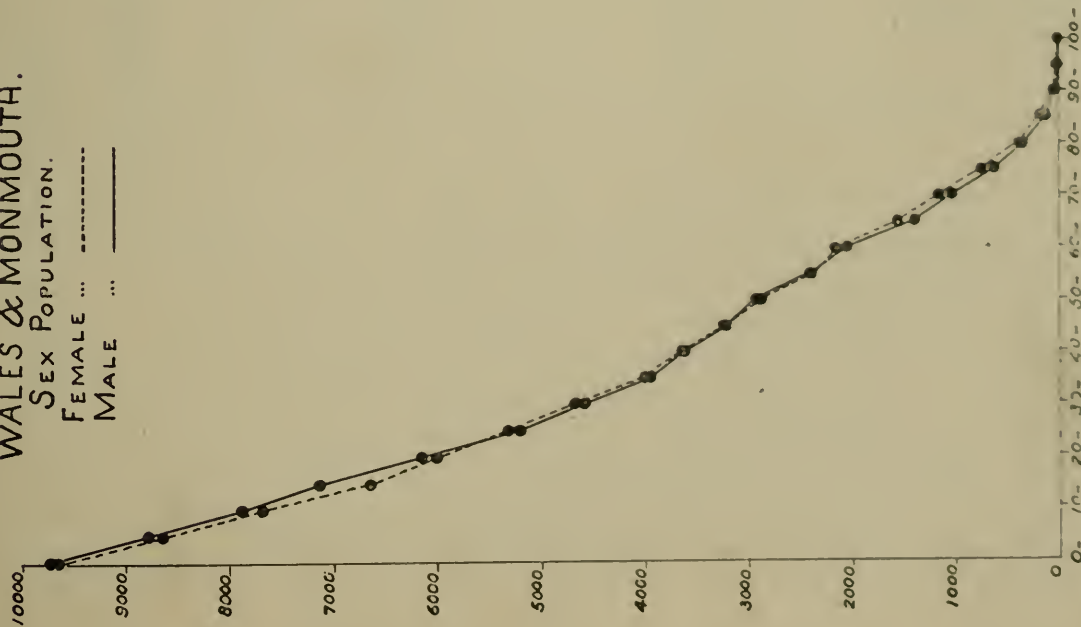
We have sought measures of the outworking of young males in order to make some allowance for this factor of migration, but it is fairly clear that

¹ It must also be noted that if the outworkers develop phthisis they probably return home to die.

CHART I.

WALES & MONMOUTH.

SEX POPULATION.
FEMALE ...
MALE ...



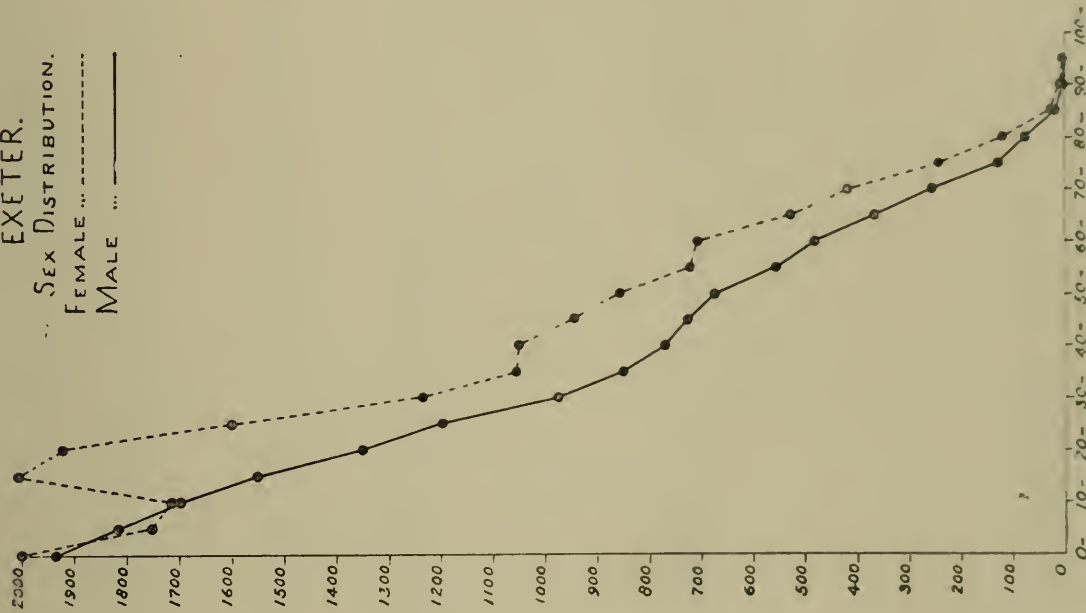
This chart shows that Wales and Monmouth as a whole have no marked sexual inequality. Deviations in the sex-ratio are due largely to internal migration.

N.B.—The vertical scale gives the total populations; the horizontal scale gives the age groups—i.e., 30- means all individuals of ages 30 up to but not including 35 years

CHART II.

EXETER.

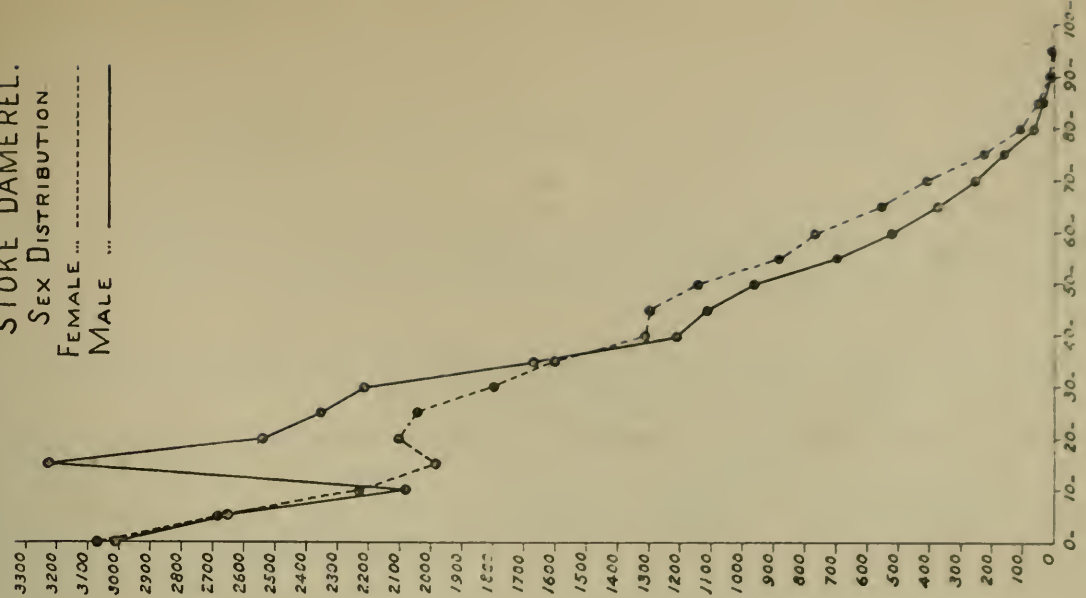
SEX DISTRIBUTION.
FEMALE ...
MALE ...



This chart shows the effect of influx of young female servants into a residential town.

CHART III.

STOKE DAMEREL.
SEX DISTRIBUTION
FEMALE ...
MALE ...



This chart shows the effect of the influx of boys and male adolescents into a dockyard town.

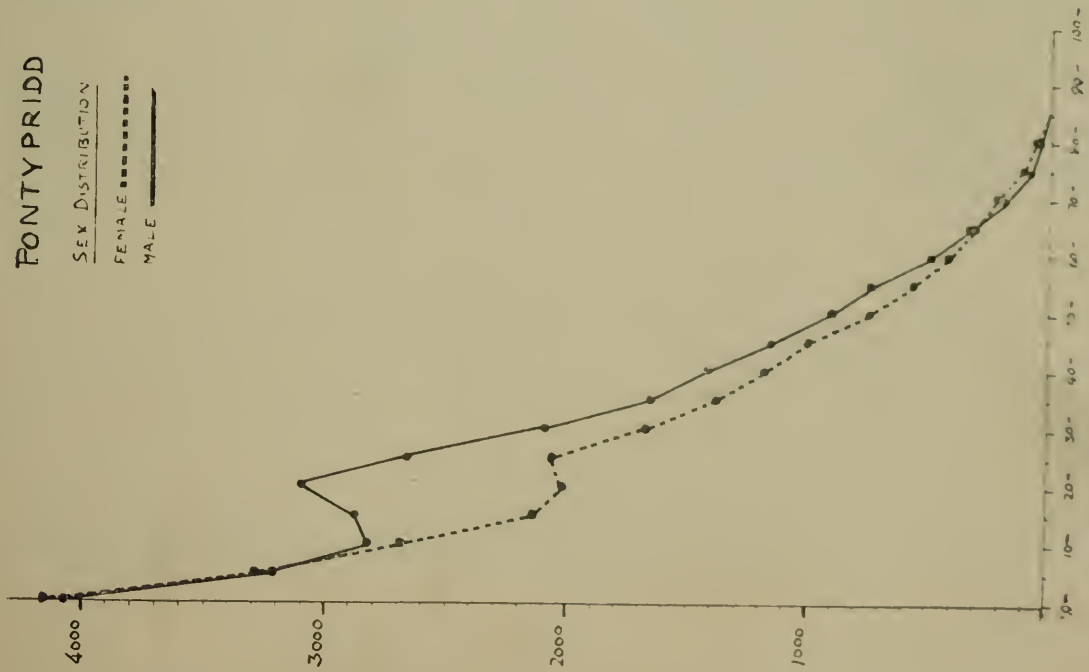
the best measure of the outworking is the sex-ratio itself. It occurred to us, however, that the husbands absent at the time of the census would be a fair measure of the general amount of outworking in a district.

RELATION OF ABSENT HUSBANDS AT TIME OF CENSUS TO PHTHISIS DEATH-RATE OF ADOLESCENT MALES.

Name of registration district	Excess of wives	Excess of husbands	AGES 15-20		Sex-ratio, husbands to wives
			Sex-ratio	Male phthisis-rate	
Holywell	24	—	122	26	100
Knighton	—	11	117	24	102
Ruthin	8	—	114	16	100
Corwen	25	—	113	39	99
Forden	2	—	113	20	100
Newtown	33	—	112	41	99
Pembroke	45	—	111	27	99
Kington and Presteign ...	—	11	110	27	102
Bala	—	4	110	30	100
Rhayader	—	8	109	37	101
Crickhowell	3	—	107	16	100
Dolgelly	57	—	105	34	98
Carnarvon	231	—	105	42	97
Machynlleth	41	—	103	40	98
Hay	11	—	102	23	99
Llanfyllin... ..	15	—	102	39	100
Llanrwst	46	—	101	37	98
Narberth	72	—	100	44	98
Builth	—	3	100	33	100
Anglesey	260	—	99	50	96
Llandoverly	24	—	95	36	99
Conway	69	—	94	25	97
Tregaron	89	—	93	37	95
Llandilofawr	33	—	90	48	99
Lampeter... ..	39	—	90	33	97
Aberystwith	256	—	90	40	94
Pwllheli	270	—	88	35	92
Newcastle-in-Emlyn ...	232	—	85	51	92
Cardigan	534	—	79	53	82
Aberayron	382	—	77	69	82

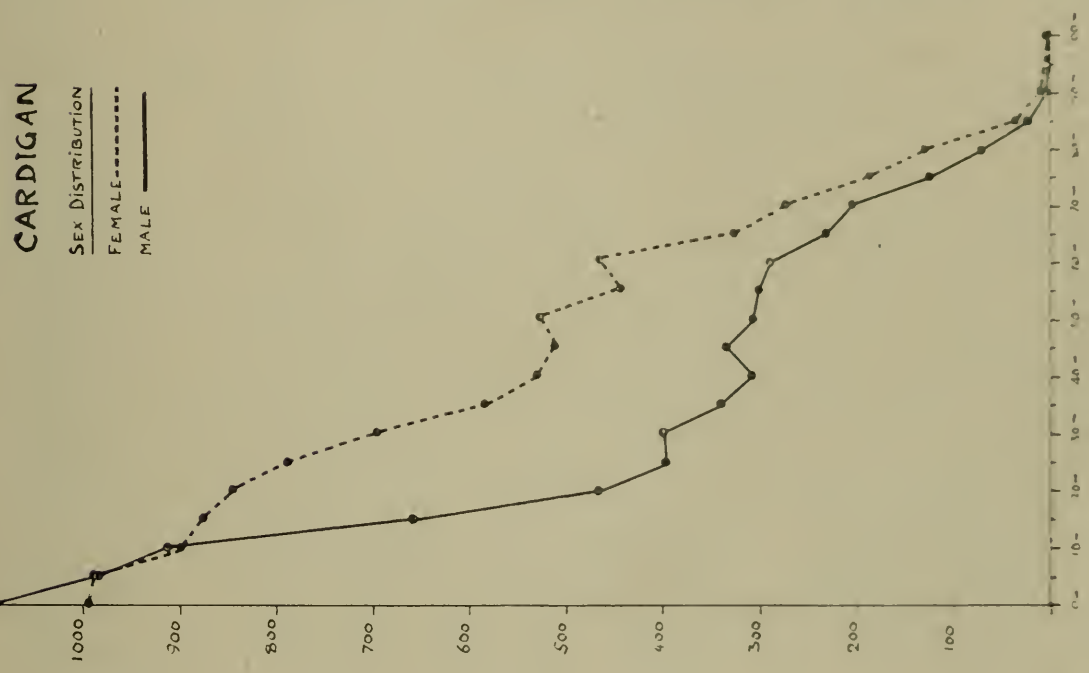
The accompanying table gives a very rough means of appreciating the relation of excess of wives over husbands to both the male phthisis death-rate (15 to 20) and the sex-ratio at these ages. It will be seen at once that excess of wives, absolutely or measured by the ratio husbands to wives, is closely correlated with the phthisis death-rate among males, the bulk of whom are not yet married. In our actual correlation we have used the husband-wife ratio calculated to an additional figure. It is true that this ratio of all husbands to wives is weakened by the fact that the older husbands have generally ceased to outwork. If we take the sex-ratio of husbands and wives 15-45, we do not get the real total of husbands for the corresponding wives, as some husbands may

CHART IV.



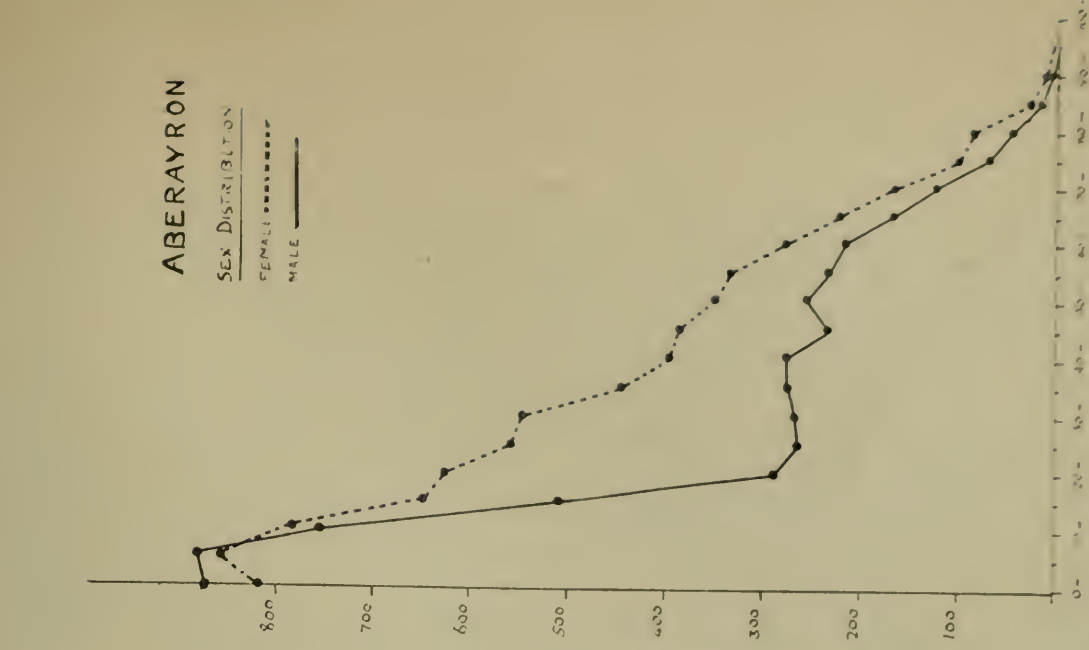
This chart shows the influx of male adolescents into a mining district. Both III and IV indicate also a slight influx of females when the older immigrants marry.

CHART V.



This chart indicates the outflow of adolescent males to outwork.

CHART VI.



This chart shows the same outflow of adolescent males from a second district.

Cardigan and Aberayron stand at the bottom of Dr. Snow's list.

N.B.—The vertical scale gives the total populations; the horizontal scale gives the age-groups—i.e., 30- means all individuals of ages 30 up to but not including 35 years.

be over 45 and have wives younger, or vice versa, although we shall exclude a number of marriages where the husband is extremely unlikely to work out. Again, we may take the sex-ratio of a single age-group (15-20). This has the advantage that only one husband in 749 belongs to this age-group and only one wife in 149, so that husbands are not directly contributory either to the sex-ratio or the male phthisis death-rate at these ages. Or lastly, we may take the sex-ratio of unmarried males and females 15-45, which covers, as our charts show, the chief migratory ages. We think that the measure of outworking husbands—husbands absent at the time of the census—should be fairly highly correlated with the number of outworking boys and young male adults.

Now let us look at some of the resulting correlations for Dr. Snow's Welsh districts. Correlation of male phthisis death-rate (aged 15-20) with—

- (1) Sex-ratio of the unmarried (15-45), $r = -0.66 \pm 0.07$.
- (2) Sex-ratio of all males and females (15-20), $r = -0.68 \pm 0.07$.
- (3) Sex-ratio of all husbands and wives, $r = -0.71 \pm 0.06$.

Thus it would appear that the phthisis rate for male adolescents is markedly influenced by husbands being away from their wives at the time of the census, although these husbands belong to a wholly different group. Absence of husbands is more influential than presence of redundant females of the like age. This appears to us to indicate that we are really dealing with a problem of migration or outworking. And our view receives confirmation from the high correlation $+0.73 \pm 0.06$ between the sex-ratio of *unmarried* males and females 15-45 and the ratio of *all* husbands to wives. If we take the partial correlation of the sex-ratio of unmarried males and females 15-45 with the phthisis death-rate of males 15-20 for a constant ratio of all husbands and wives, we find the correlation -0.6633 ± 0.07 is reduced to -0.2986 ± 0.1122 , or by more than half, and coming near the borderland of the non-significant. We do not assert it dogmatically, but it appears to us conceivable that a better measure of migration or outworking applied to safer data would show no relation at all between redundancy of females and the male phthisis death-rate.

If we take as our measure of outworking the ratio of husbands to wives 15-45, we find that the partial correlation of the male phthisis death-rate (15-20) with the sex-ratio (15-20) for constant husband and wife ratio is $= -0.37$, being reduced from -0.68 . Lastly, the partial correlation of male phthisis rate (15-20) with sex-ratio (15-20) for constant ratio of all husbands to wives is -0.325 ± 0.110 . These results indicate that at least 50 per cent. of the associations observed by Dr. Snow between phthisis death-rate and redundancy of females is due to outworking. *How much more may be due to this source cannot be determined until other measures of migration have been considered.*

It is probable that for other diseases than tuberculosis the association of deaths of males and redundancy of females does not, as Dr. Snow notes, hold. This is partly due to the fact that in 1861-70 phthisis was the special disease

of the young adult, and as lasting for some time the most disabling with regard to external work, especially mining. We find, however, a much smaller positive correlation $+0.18$ between deaths from cancer among males 15-55 and the size of the female population 15-55 for constant male population 15-55. This is what we should anticipate, but no stress can be laid on it as it is not significant owing to the paucity of districts.

We would conclude with one further note. If we are to suggest that the female infects the male (in a way that the male does not infect the female), we must form some measure of female infectivity. Now Dr. Snow does this by correlating the male phthisis deaths with the female population for a constant male population; but it appears to us that the infectivity cannot depend on the total number of females, but only on the number of females infected or on their ratio to the total population of females. It is not easy to determine a good measure of the infectivity of one age-group of individuals of one sex by those of the other, but it certainly must involve the number of *infected* individuals in the other, and this number Dr. Snow has not used. We have worked out the following correlations: Correlation of male deaths from phthisis (20-25) in forty selected districts (Snow, Table I) with female population (20-25) = $+0.670 \pm 0.059$. Correlation between male and female deaths from phthisis (age-group 20-25) in the same districts = $+0.582 \pm 0.071$. Correlation between female deaths from phthisis (ages 20-25) and female population (ages 20-25) = 0.425 ± 0.087 . Hence the partial correlation of male deaths from phthisis (ages 20-25) with the female population of this age for constant number of deaths from phthisis of the female group = $+0.574 \pm 0.072$. Now this result is most noteworthy; it shows that if we keep absolutely constant the number of female phthisis deaths, then the male phthisis deaths increase as the female population gets larger; in other words, the less the number of female deaths from phthisis relative to the female population the greater the number of male deaths from phthisis.¹ It seems quite impossible under these circumstances to suppose that the relation between male deaths from phthisis and the redundancy of females is in any way due to infectivity.

The object of this criticism has been to consider the parts infectivity and migration play in the associations noted by Dr. Snow. In undertaking it we have to record the suggestiveness of his paper, while at the same time we think those suggestions admit, with fuller study, of more definite conclusions being reached than Dr. Snow has obtained.

Dr. F. R. WALTERS: My interest in the papers read this evening is chiefly from the clinical point of view, as I am not a mathematician, and especially as regards pulmonary tuberculosis. In all statistics bearing on tuberculosis a sharp distinction should be drawn between tuberculization and tuberculosis—between infection with tubercle bacilli, which is almost universal in an urban

¹ The reader must bear in mind that these districts have already been selected by Dr. Snow to give a *practically constant male population*.

population, and tuberculous illness, which depends on contributory causes, some personal, others environmental. Many infected with tubercle never suffer from it, but remain permanently in good health. In other cases a breakdown happens years after infection. I saw a widow, aged 51, the other day who had almost certainly been infected with tubercle by her mother twenty-five years before, but had worked hard and brought up a large and healthy family and remained in good health until two or three years ago, when the extraction of a large number of teeth, and the strain of nursing her husband, who died of hepatic cancer, affected her health. Now there is extensive pulmonary disease of an inactive type, though her health is but slightly affected. Tubercle bacilli were only discovered accidentally in the sputum a short time ago. In diagnosing pulmonary tuberculosis the presence of tubercle bacilli in the sputum should not be considered essential. Many people still regard with suspicion all cases stated to be tuberculous without such confirmation. If the observer is competent this attitude is quite unjustifiable, and it is a pity that so many refuse to regard a case as tuberculous until the most favourable stage for treatment has gone by. If there is clinical evidence of pulmonary tubercle, apart from tubercle bacilli in the sputum, if the observer is competent, and there is ill-health reasonably attributable to tubercle and not otherwise explicable, the case should be regarded and classified as one of tuberculosis. But I do not think that a case of tuberculous infection without ill-health should be so regarded.

As regards the statistical investigation of results of treatment, it is unsafe to depend on end-results, such as length of survival, the disappearance of tubercle bacilli from the sputum, or apparent healing of the tuberculous lesions in the lung. We are dealing with a disease which often progresses slowly, ebbs and flows, and may last for years; whereas the time for treatment may be only a few weeks or months out of the whole. End-results could only be depended upon as a measure of the value of treatment—whether by tuberculin, or hygienic measures, or inhalations, or special drugs—in cases where the patient is continuously treated under known conditions for long periods of time. The progress of the disease is at least as much influenced by conditions of life as by any known remedy, so that the end-results are far more a measure of the influence of such conditions of life—which last for years—as of the special treatment adopted, which lasts a relatively short time. To measure the effects of special treatment we need a more finely graduated scale than is generally adopted. This scale must take into account the constitutional as well as the local results, and these must be stated separately, as pointed out years ago by the late Dr. C. Theodore Williams. Recovery depends at least as much on the immunizing response of the body as on the anatomical extent and severity of the local lesion. A case with very limited disease but high fever is more dangerous than one with extensive local damage but with little constitutional disturbance. The earliest and most marked effects of treatment are usually alterations in general health; and we must state these accurately at the beginning and the end of treatment.

It is quite possible to construct a ladder of progress on which can be indicated the position of the patient before and after treatment, the progress being shown by the number of rungs up which he has climbed. There are two tests which nearly cover the field, and are available right up the scale—viz., fever, and the capacity for exertion. In the febrile the degree of fever at rest, in the afebrile the amount and kind of exercise which can be taken without disturbing temperature or general bodily health, are a measure of the progress towards recovery. On the side of the respiratory system, we should indicate both the changes in physical signs and those in function, such as cough and sputum. The Turban-Gerhardt classification is much too coarse for our purpose. To use it is much like attempting to measure all microscopic objects in tenths of an inch, to the exclusion of all finer measures. A form of classification can easily be made which is comparable with the Turban-Gerhardt and other recognized methods, but more precise and with finer gradations. Instead of measuring by half lobes or lobes, each lung may be divided into a dozen natural areas; and the Turban-Gerhardt degrees of severity—which we may term discrete and confluent infiltration—may be subdivided with advantage. By such a method the results of a month's treatment may be definitely estimated, an impossibility by the unmodified Turban-Gerhardt method.

Dr. EVERITT E. NORTON confessed that he was personally more interested in the clinical than in the strictly statistical question, but on the latter he wished to emphasize the importance of one statement made by Dr. Clark: "What is chiefly needed is the observation over as long a period as possible of cases of chronic ill-health, the careful classification of facts so observed, and the statistical comparison and correlation of all facts. . . . In the work upon which we are engaged we hope to learn something concerning the duration of the disease [pulmonary tuberculosis] apart from the mortality; and as to its characters as compared with experience in the past."

Dr. McVAIL said that Dr. Snow had done well to go back to the period of 1850-60 and to study statistics unaffected by modern views as to causation and treatment of tuberculosis. It was clear, however, as pointed out by Professor Karl Pearson, that a good deal of knowledge was required of local facts and social conditions at the period in question in the districts selected. Dr. Hilda Clark's paper showed well the difficulties met with in investigating tuberculous disease. Obviously, as regards the factors of heredity and infection, a useful contrast could be drawn between the occurrence of tuberculosis in the children of a tuberculous parent, and the occurrence of the disease in the husband of a tuberculous wife or the wife of a tuberculous husband where different stocks were concerned. The question here, however, was seriously complicated by the commonly accepted view that young people are much more liable to infection than their elders, so that the escape of the husband or wife might be due not to difference of stock but to age.

In presence of the highly interesting discussions continually taking place on these and kindred aspects of the tuberculosis question, the public health officer or the practitioner engaged in efforts to prevent or ameliorate the ravages of the disease, was perhaps apt to be unduly disturbed by doubts as to the value of the action he was taking. Such doubts Dr. McVail regarded as without any sufficient foundation. Whether the tuberculosis was mainly infectious or mainly hereditary, the individual would be better fitted to resist the influence of infection or heredity if he was living in a well-ventilated house, and provided with proper food and clothing and under skilled discipline in the physical conduct of his life. As regards sanatorium treatment, nearly everybody would be the better of a period of rest and recuperation and treatment in a well-managed institution in a healthy country district, under the supervision of a resident physician. One important fact in connection with all such items—house accommodation, food, clothing, cleanliness, country rest and so forth—was that they were of value not merely against tuberculosis but against almost every disease that flesh is heir to. Those, therefore, who were engaged in this crusade should act hopefully and fearlessly in the certain knowledge that their work was on good lines and essentially beneficial to all concerned.

Dr. SHRUBSALL suggested that the racial constitution of the populations was a consideration, not so far referred to in the discussion, which might to some extent explain differences in mortality. Data for some of the areas collected in the period between 1860 and 1870 were to be found in the works of Beddoe. It would be noted that generally the higher mortality rates occurred in the areas with the most brunette populations. At the present time there was a greater morbidity from pulmonary tuberculosis among brunettes than among blondes, a feature also noted by Liddon in 1853. Data showing the colour traits prevailing at the period under consideration for either sex were available in some areas, and it appeared that where the males were on the average much darker than the females they presented a higher mortality, and where the females were the darker there the female mortality was higher than the male. It also appeared from the sex-ratios that there was a greater male migration from the Celtic areas of Wales than from those parts occupied in considerable numbers by West Saxons, Mercians, or Normans.

The PRESIDENT said that Dr. Snow had called attention to the populations "engaged on defence" in Elham, Sheppey, and Eastry. It was interesting to note that Sir George Buchanan in his Report, prepared more than fifty years ago, made a similar comment. Study of Dr. Snow's paper brought to light several facts which increased, if that were possible, one's admiration for Sir George Buchanan's original paper. Dr. Snow thought the selection of the men might explain the low male phthisis-rates, but he said, "As it can hardly be asserted that the females in these districts are also selected we cannot *definitely* argue that the low mortality of the males is due to a large proportion of them being selected individuals." Sir George Buchanan had, however,

discussed this difficulty (pp. 92 and 93 of his Report), and explained the low rates of both males and females as being due to selection and to the occurrence of death elsewhere than in the registration district in question.

Dr. SNOW, in reply: I wish to deal chiefly with the points raised by Professor Pearson. He is confident that the consideration referred to in section (8) (iii), viz., that of differential migration, was the chief cause in producing the fact brought out of the association between low sex-ratio and high male phthisis mortality. His diagrams and figures of absent husbands, however, indicate only the extent of the migration—a point which was not in doubt, section (8) (iv). The point he emphasizes is that the low sex-ratio of certain of the districts was produced by the emigration of the strong males to the mines. This appears very reasonable, but requires further investigation; a hurried and tentative way of approaching the matter is referred to below. Since the meeting I have received from Dr. Chalmers a copy of his recent paper,¹ in which he notes the relatively greater prevalence of phthisis among immigrant families in Glasgow. I have not seen his original figures, and am not sure if the statement is based upon the experience of comparable populations as regards age, occupation, &c., and, moreover, occupations in Glasgow probably do not require the strong and vigorous males necessary in the mines, but it at least suggests that the weakly males also migrate, but to other places than do the strong, and I am not persuaded to accept Professor Pearson's explanation as final. I hope to find time for a thorough investigation into this aspect of the matter, but for present purposes it is possible, I think, to approach the question *very approximately* in a more satisfactory manner than by the use of the proportion of husbands absent as an indication of the extent of migration. This proportion does not show the magnitude of migration for individual age-groups, and moreover it is important to ascertain if the sex-ratio in a particular district is produced more by emigration of males than by immigration of females. I deal here only with the age-group 15-20. There is little movement of the population in rural parts before the age of 15, and if there were no migration (15-20) and the death-rates (15-20) for a series of districts were the same, the ratio of the population (10-15) to that (15-20) would be approximately the same for each district. But if we actually find *considerable* variation in that ratio we shall infer that in districts in which it is high emigration occurs between 15 and 20, and conversely. No weight, however, can be attached to small differences, as these might readily arise through variation in the death-rates. I have found the ratio of the mean population (1861-70) of the (10-15) group to that of the (15-20) group for both males and females in the case of (a) the aggregate of the thirty Welsh districts, (b) the whole of Wales and Monmouth, and (c) the whole of England and Wales,² and

¹ "A Page in the Natural History of Pulmonary Tuberculosis," *Public Health*, November, 1913.

² These ratios are (a) 0·8855, 0·8928, (b) 0·9146, 0·8906, and (c) 0·8956, 0·9207.

have applied these factors to the (10-15) populations of each of the Welsh districts. In this way certain figures have been reached which give, under the three heads, (a), (b), (c), a *rough general idea* of what the populations would have been had there been no migration. These are stated below for the thirteen districts dealt with in detail in the paper, and may be compared with the actual populations. Although we can make no inferences from small differences, certain features of the table appear to point to definite facts. For instance, the high sex-ratio of Holywell was produced much more by emigration of females than by immigration of males, and the lower one of Aberayron by emigration of males. On the whole, however, throughout the thirteen places stated, the movement of females appears to have been as important as that of males in producing variations in the sex-ratio (15-20). The question of the migration of the less phthisical males does not arise in districts in which the high or low sex-ratio is produced mainly by the movement of females, and we can get rid of the effect of the emigration of males by dealing only with such districts. I hope to do this in future work when I measure the extent of migration more exactly.

1861-70.

District	Number of males, 15-20	NUMBER OF MALES (15-20) IF THE PROPORTION (10-15) TO (15-20) WERE THE SAME AS			MALE DEATHS (15-20)		Number of females, 15-20	NUMBER OF FEMALES (15-20) IF THE PROPORTION (10-15) TO (15-20) WERE THE SAME AS		
		All thirty districts	Wales and Mon-mouth	England and Wales	All causes	Phthisis		All thirty districts	Wales and Mon-mouth	England and Wales
Holywell ...	2,143	2,110	2,180	2,130	146	56	1,756	2,000	1,990	2,060
Knighton ...	541	540	560	550	22	13	460	500	500	510
Ruthin ...	812	810	840	820	44	13	712	760	760	790
Corwen ...	802	790	820	800	67	31	705	810	810	840
Forden ...	977	940	970	950	55	20	867	900	900	930
Newtown ...	1,279	1,210	1,250	1,220	105	52	1,139	1,220	1,210	1,250
Llandilofawr	850	850	880	860	64	41	941	860	860	890
Lampeter ...	459	500	520	510	28	13	508	500	490	510
Aberystwith...	1,262	1,270	1,320	1,290	112	51	1,403	1,330	1,330	1,370
Pwllheli ...	921	980	1,020	1,000	61	32	1,038	1,020	1,020	1,050
Newcastle ...	848	950	980	960	64	43	998	900	900	930
Cardigan ...	746	850	880	870	72	40	948	870	870	900
Aberayron ...	535	660	680	670	70	37	698	690	690	710

Let us now, instead of using the male phthisis-rates based upon the populations stated in the report, calculate those based upon the populations in the second column of figures below—i.e., the *approximate* populations had there been no male migration. (It makes little difference if we employ those of the third or fourth columns.) These are shown in brackets in Table III (p. 29) for each of the thirty districts, and it will be noticed that in spite of the alterations in the populations the top districts still have the smallest rates

and the bottom ones the largest. The average of the six rates at the top is unaltered at 0.28, and of the bottom seven is reduced from 0.47 to 0.43. These considerations, worked out very roughly and hurriedly in consequence of Professor Pearson's remarks, confirm me for the present in the conclusion that migration, though it probably had some effect in producing certain of the associations, was not the sole cause of all them.

Concerning Professor Pearson's observations about the inclusion of Christchurch in one of the preliminary samples used, I was unaware of the existence of a sanatorium there in 1861-70, and agree that the inclusion of that district in the sample was undesirable. The female phthisis mortality (20-25) for that district was approximately the average of those stated in Table I, and I have been unable to confirm from the Registrar-General's Annual Reports and Supplement Professor Pearson's statement that about twenty of the forty-one male deaths (20-25) (*see* Table I) in Christchurch occurred in the institution referred to. I have ascertained, however, that the number of inmates (excluding officers) in 1861 was eleven males and eleven females (ages not stated) and in 1871 was seventeen males and seventeen females (ages not stated). The only information of the mortality I can find is that in 1869 one male (age not stated) died there and in 1870 four males (ages not stated). The male mortality (20-25) of Christchurch was probably affected by these deaths, but the facts brought out in the paper remain unaltered.

In concluding my remarks on Professor Pearson's contribution to the discussion I think it advisable to repeat once again what is frequently stated in the paper and emphasized in section (15), that the work is based upon an idea which is to me nothing more than a *hypothesis*. Certain phrases can, I know, be pointed to in which the idea is referred to without the word "hypothesis" being actually used, but it is stated without ambiguity in section (3) that the hypothesis is to be discarded, if necessary, when it has done its duty in assisting in the deduction of new facts. A hypothesis is justified in science, whatever its ultimate end, provided any new fact can be deduced from it.

Dr. Shruballs's statement that there is some variation of racial constitution within the Welsh area dealt with, and that this may be associated with the variation in the incidence of phthisis, is one I hope to follow up.

With regard to the President's remarks, the reason for choosing rural areas is mainly a statistical one. In certain urban areas the actual population living at the beginning of a decade may be widely different from that at the end, though the number may alter but little. (The figures of the number of removals to be traced at Parliamentary elections is some evidence of this.) Concerning his interesting statement that it had been pointed out many years ago that the married women of Elham were a selected class, this might be the explanation of the low female mortality at ages over 20, but to a small extent only for the (15-20) group. I have looked into the figures for the places mentioned by Dr. Hamer in which the type of occupation was such as to attract women, but, for the period 1861-70 at any rate, the low sex-ratios of

these districts do not appear to have been produced mainly by immigration of females. Emigration of males was also operative in some of the districts extensively. As pointed out by the President, however, the phthisis mortality of the males (15-20) and (20-25) in these places was not above that of other places in the same counties.

[It should be pointed out that the reply to Professor Pearson's criticism had to be made with no written or printed copy of his remarks before me. On reading a proof of the contribution by himself and Dr. Heron, I am conscious of other points which should have been discussed, but at first reading I see nothing to cause me to modify my statement that I am not persuaded to accept without further investigation Professor Pearson's view as the final and sole explanation of the facts brought out in the paper. With regard to Professor Pearson's last correlation indicating a negative association between female phthisis mortality and male phthisis mortality, I may state that I have many correlations (worked out at the same time as those in the paper) pointing in the opposite direction.]

Dr. HILDA CLARK, in reply: I have little further to add at present to the summary of difficulties set forth in my paper. As regards the estimation of the hereditary factor in the causation of deaths from phthisis, this is not entirely simplified by the fact that all persons are exposed to infection, since all are not equally exposed, and those who may be supposed to inherit a susceptible diathesis from parents who die of phthisis are also exposed to a greater and more certain risk of infection in childhood. Our attention has been drawn to the importance, in estimating the effect of social conditions on the incidence of phthisis, of taking into consideration the conditions under which the patient lived when infection was incurred, or at any rate when the disease first declared itself, and not those to which the patient was reduced by illness. I may point out that light may also be thrown on this by a study of the incidence and behaviour of the disease in populations that are homogeneous as regards social conditions and not complicated by wide divergences of standards among people living and working near each other. This I am trying to carry out with regard to the evidence obtained at Street and at Portsmouth, which will then be available for comparison with other districts where the standard may be different.

Section of Epidemiology and State Medicine.¹

January 23, 1914.

Dr. W. H. HAMER, President of the Section, in the Chair.

Stillbirths: The Case for their Compulsory Registration and their Definition.

By R. DUDFIELD, M.B.

IF any confidence can be placed on present indications, changes may be anticipated at no very distant date in the laws dealing with the registration of births and deaths. The present occasion is not one for a general discussion of the amendments which are necessary or desirable, and only one—viz., the registration of stillbirths—will be dealt with. The discussion on the mortality of infants during the first month of life which took place at the recent International Medical Congress, and the Royal Commission on Venereal Diseases now sitting, furnish additional justification for a careful consideration of the relationship between the causes of stillbirths and those of infantile mortality.

As the main object of this paper is to demonstrate the urgent necessity of official cognizance being taken of prænatal mortality, it appears to be desirable to begin with the evidence in support of the contention that the study of the causes of stillbirths is essential for the reduction of infantile mortality below its present level.

I.

This country, in common with many others, is faced with the problem of a much reduced output of new lives, associated with an exodus of population on a vast scale to new countries. It is generally recognized that national growth and national prosperity are intimately associated the one with the other, so that the reduction in reproductivity

¹ Joint Meeting with the Obstetrical and Gynæcological Section.

is a question of the highest importance. The changes in the birth-rate which have taken place in this country during the half century 1861-1910 are shown in Table I. The crude annual birth-rates have been

TABLE I.—ENGLAND AND WALES.

Quinquennia	AVERAGE ANNUAL RATES			INDEX-NUMBERS		
	Births	Deaths	Natural increment	Births	Deaths	Natural increment
1861-65	35·14	22·58	12·56	100	100	100
1866-70	35·28	22·42	12·86	100	99	102
1871-75	35·48	21·96	13·52	101	97	108
1876-80	35·36	20·80	14·56	101	92	116
1881-85	33·54	19·40	14·14	95	86	112
1886-90	31·44	18·88	12·56	89	84	100
1891-95	30·48	18·74	11·74	87	83	93
1896-1900	29·26	17·68	11·58	83	78	92
1901-05	28·16	16·06	12·10	80	71	96
1906-10	26·26	14·70	11·56	75	65	92

used because the question for consideration is the total annual harvest of new lives, and not one of fertility measured by the proportions of fecund individuals in the population. The birth-index-number for the quinquennium 1906-10 (75) shows a fall of 25 points below that for the quinquennium 1861-65, a change which means that the yield in the last quinquennium was only three-quarters of that of the first. The reduction in the annual rate of natural increment does not show a decrease commensurate with the reduction in the harvest of new lives, the increment-index-number for 1906-10 being only 8 points below that for 1861-65. The maintenance of the rate of increment has been due to the great reduction in the total mortality at all ages, the death-index-number showing a fall of 35 points in 1906-10. Owing to the drain of emigration the actual increment of the population as determined at the census has been nothing like so great as that indicated in the table.

While the total mortality during the fifty years under review has

steadily decreased, the infantile mortality has fluctuated in an irregular manner, first decreasing, then increasing, and in the last two quinquennia notably decreasing. Table II shows how that rate—in quinquennial averages—has moved. In the last quinquennium the index-number was 23 points down as compared with 35 in the case of the total (all age) mortality. Moreover, as will now be shown, the nearer to birth the less the actual reduction in mortality. To illustrate this the data for the twenty years 1891-1910 will be used. It is a coincidence that the total infantile mortality in 1891 was the same as in 1861—viz., 151 per 1,000 births.

TABLE II.—ENGLAND AND WALES.

Quinquennia	INFANTILE MORTALITY	
	Average annual rates	Index-numbers
1861-65	151	100
1866-70	157	103
1871-75	153	101
1876-80	144	95
1881-85	134	91
1886-90	145	96
1891-95	151	100
1896-1900	156	103
1901-05	138	91
1906-10	117	77

Table III gives the average mortality-rates from all causes per 1,000 births recorded in the four quinquennia 1891-1910, for the first year of life and for the three subdivisions of that year for which data are given in the Annual Reports of the Registrar-General. Attention will be more profitably given to the index-numbers. The general trend of the figures is the same for persons, males and females, but some occasional irregularities can be observed. For the whole year there is to be seen a fall of 22 points in the persons-index-number. At ages under 3 months the fall is 14 points only, increasing to 29 at ages 3 to 6 months, and 30 at ages 6 to 12 months. It may be objected that

mortality-rates in the second and third age-periods ought to be calculated on the survivors at those ages rather than the number of children born. To meet such objection Table IV has been prepared, but the results do not differ materially from those given in Table III. The extent to which the present methods of checking mortality become less effective as the data are drawn from the opening months of life is illustrated by the following comparison:—

		Mortality at ages		Reduction in index-number (1906-10)
For fifty years, 1861-1910	...	{ All ages ...	...	35 points
		{ Under 1 year ...	...	23 „
		{ All ages ...	...	22 „
		{ (Under 1 year ...	...	22) „
For twenty years, 1891-1910	...	{ 6 to 12 months ...	...	30 „
		{ 3 to 6 „ ...	...	29 „
		{ 0 to 3 „ ...	...	14 „

TABLE III.—ENGLAND AND WALES.

Quinquennia	MORTALITY-RATES (PER 1,000 BIRTHS)				INDEX-NUMBERS			
	At ages (months)			Under one year	At ages (months)			'Under one year
	0—	3—	6-12		0—	3—	6—	
<i>Persons.</i>								
1891-95	73·53	31·08	45·89	150·51	100	100	100	100
1896-1900	74·41	33·54	48·13	156·09	101	108	105	104
1901-05	69·63	27·77	40·41	137·82	95	89	88	91
1906-10	62·97	22·01	32·08	117·07	86	71	70	78
<i>Males.</i>								
1891-95	82·18	33·85	49·09	165·13	100	100	100	100
1896-1900	83·18	36·17	51·00	170·37	101	107	104	103
1901-05	78·29	30·17	42·89	151·36	95	89	87	92
1906-10	70·95	23·89	34·15	129·01	86	70	69	78
<i>Females.</i>								
1891-95	64·57	28·22	42·56	135·36	100	100	100	100
1896-1900	65·33	30·81	45·15	141·30	101	109	106	104
1901-05	60·64	25·28	37·83	123·77	94	89	89	91
1906-10	54·69	20·05	29·92	104·67	85	71	70	77

Unfortunately, the data published in the Annual Reports of the Registrar-General do not permit any inquiry as to the changes in the rates of mortality at ages less than 0-3 months. The requisite data for the twenty years 1891-1910 are, however, available for one London Borough—viz., Paddington. The Paddington data are based on deaths occurring among (on an average) 3,000 children born each year. To

TABLE IV.—ENGLAND AND WALES.

Quinquennia	Mortality per 1,000 born and surviving at ages (months)			Index-numbers		
	0—	3—	6-12	0—	3—	6-12
<i>Persons.</i>						
1891-95	73·53	33·55	51·25	100	100	100
1896-1900	74·41	36·24	53·95	101	108	105
1901-05	69·63	29·85	44·77	95	89	87
1906-10	62·97	23·49	35·06	86	70	68
<i>Males.</i>						
1891-95	82·18	36·88	55·53	100	100	100
1896-1900	83·18	39·45	57·92	101	107	104
1901-05	78·29	32·73	48·11	93	89	87
1906-10	70·95	25·72	37·74	86	70	68
<i>Females.</i>						
1891-95	64·57	30·17	46·92	100	100	100
1896-1900	65·33	32·97	49·95	101	109	106
1901-05	60·64	26·92	41·39	94	89	88
1906-10	54·69	21·21	32·34	85	70	69

afford a standard of comparison with the whole country the average quinquennial rates calculated as before are set out in Table V, together with the index-numbers. The figures given in this table should be compared with those in Table III. On the whole there is a general agreement between the two tables, but the figures in Table V show greater irregularities than those observed in Table III. Such differences are to be expected having regard to the smaller population from which the data are drawn.

The index-numbers in Table V for persons show the same diminution in the decrease in mortality at the lower ages. At ages 6 to 12 months the mortality in the fourth quinquennium was 39 points below that recorded in the first; at ages 3 to 6 months 30 points, and at ages 0 to 3 months only 17. Passing to Table VI, a similar phenomenon

TABLE V.—PADDINGTON.

Quinquennia	MORTALITY-RATES				INDEX-NUMBERS			
	At ages (months)			Under one year	At ages (months)			Under one year
	0—	3—	6-12		0—	3—	6-12	
<i>Persons.</i>								
1891-95	73·75	29·50	44·39	147·65	100	100	100	100
1896-1900	75·84	33·08	47·13	156·05	103	112	106	106
1901-05	65·36	26·33	36·97	128·67	89	89	83	87
1906-10	61·54	20·71	27·24	109·49	83	70	61	74
<i>Males.</i>								
1891-95	79·61	30·53	49·87	160·02	100	100	100	100
1896-1900	85·30	35·47	52·17	172·94	107	116	105	108
1901-05	73·50	28·44	39·56	141·50	92	93	79	88
1906-10	68·86	22·65	29·86	121·38	86	74	60	76
<i>Females.</i>								
1891-95	67·67	28·42	38·69	134·79	100	100	100	100
1896-1900	65·77	30·53	41·77	135·30	97	107	108	100
1901-05	56·94	24·13	34·29	115·37	84	85	89	85
1906-10	53·84	18·67	24·48	97·00	79	66	63	72

can be observed in the three age-periods therein given, the reduction in the fourth quinquennium amounting to 12 points at ages under 1 month, to 14 under 1 week, and to 4 only at ages under 1 day. So that it may be accepted as demonstrated that the present methods employed for combatting infantile mortality are of comparatively little effect upon those causes of mortality which are operative during the earliest days of extra-uterine life.

The commonest causes of death in the first month of extra-uterine life are (1) premature birth, and (2) congenital defects and malformations. The mortality from those causes during the past twenty years has increased, a fact which is clearly shown by the figures in Table VII. In the whole country the index-number for premature birth shows an

TABLE VI.—PADDINGTON.

Quinquennia	MORTALITY-RATES			INDEX-NUMBERS		
	Under one month	Under one week	Under one day	Under one month	Under one week	Under one day
<i>Persons.</i>						
1891-95	42.69	26.17	12.57	100	100	100
1896-1900	46.46	26.35	13.64	109	101	108
1901-05	39.34	21.83	10.51	92	83	84
1906-10	37.53	22.55	11.87	88	86	96

TABLE VII.—ENGLAND AND WALES.

Quinquennia	MORTALITY-RATES				INDEX-NUMBERS			
	Premature birth	Congenital malformations	Totals	All other causes	Pre-mature birth	Congenital malformations	Totals	All other causes
<i>Persons.</i>								
1891-95	18.42	4.03	22.45	128.05	100	100	100	100
1896-1900	19.61	4.33	23.95	132.13	106	107	107	103
1901-05	20.25	6.19	26.47	111.35	110	154	118	87
1906-10	19.92	7.02	26.95	90.12	108	174	120	70

increase of 8 points, that of congenital defects of 74 points. While the index-number for the total mortality from these two causes shows an increase of 20 points, that for the mortality from all other causes shows a decline of 30 points. From the Paddington data (Table VIII) it appears that the index-number for premature birth has fallen by 3 points, and that for congenital defects risen by 41 points.

It will be observed that in both tables there are sudden changes in the figures in passing from the second to the third quinquennium. New tables of classification were introduced in 1901, and doubtless the changes observed in the tables should be attributed to that fact. There remains, however, the further fact that in each case there has

TABLE VIII.—PADDINGTON.

Quinquennia	MORTALITY-RATES				INDEX-NUMBERS			
	Premature birth	Congenital malformations	Totals	All other causes	Pre-mature birth	Congenital malformations	Totals	All other causes
<i>Persons.</i>								
1891-95	19·57	5·30	24·88	122·77	100	100	100	100
1896-1900	20·43	7·53	27·97	128·08	104	142	112	104
1901-05	18·54	6·20	24·75	103·92	95	117	99	85
1906-10	18·93	7·45	26·38	83·11	97	141	106	68

been recorded in each decennium an increased mortality from these causes. This is shown by the following figures:—

Increase in index-number		England and Wales		Paddington	
Premature birth and congenital defects	Second quinquennium	...	+ 7	...	+ 12
	(First	„	= 100)		
	Fourth quinquennium	...	+ 1	...	+ 6
	(Third	„	= 100)		

The conclusion which appears to be the natural outcome of the foregoing statistics is that the present methods adopted to limit infantile mortality are insufficient, inasmuch as they have little or no influence on the antenatal causes of such mortality. Doubtless more success in reducing post-natal infantile mortality may be anticipated from the present methods in the near future, but there will still remain the necessity for taking action against antenatal conditions prejudicial to infant life and health. It will be admitted that at present the available knowledge of such conditions is but scanty. It is with a view to extending such knowledge that the registration of stillbirths is advocated. A study of the causes of stillbirths will furnish not only information as

to the measures necessary to prevent that form of mortality, but will also greatly assist the study of the causes of post-natal mortality and ill-health.

II.

Passing on to a consideration of the practice of registration of stillbirths, it appears from the Report issued by the Royal Statistical Society in 1912, that in countries¹ where the registration of births is required, the registration of stillbirths is compulsory except in

England and Wales, Ireland, Scotland, Gibraltar, Cyprus, Hong Kong, Gambia, Orange Free States, Sierra Leone, Jamaica, New Brunswick, New South Wales, New Zealand, Queensland, South Australia, Tasmania, Victoria, and Denmark.

As regards the last-named country, registration is practically universal, although not required by law. In fact, it appears that it is only in such registration countries as may be assumed to have framed their registration laws on the English model that the registration of stillbirths is not required.

The present position of the General Register Office towards stillbirth can best be illustrated by the following extract from the Official Instructions to the Registrars:—

“No record of stillborn children may be made in a register of births or deaths. Even when an inquest has been held and when, according to the finding of the jury, the child was stillborn or there was not sufficient evidence to prove that the child was born alive, no record may be made.”

In effect, stillbirths are *qua* registration non-existent. This attitude is attributable to the inclusion—an unfortunate one—of the word “alive,”² in Section 1 of the Births and Deaths Registration Act, 1874 (37 and 38 Vic. c. 88).

It may be urged, that inasmuch as the Notification of Births Act, 1907, requires stillbirths to be notified, registration is unnecessary.

¹ The Report collated information furnished by 100 registration offices scattered throughout the world. On page 3 of the Report there will be found a list of the countries and states from which no information was received.

² The Section opens, “In the case of every child born alive after the commencement of this Act. . . .” The repeal of the word “alive” would enable the registration of stillbirths to be enforced.

That Act is, however, an adoptive one, and at the present time is in force in 407 out of 1,809 sanitary districts, with a population (Census, 1911) of 21,196,901 persons, the total population of the country being 36,070,492.¹ Such defect could be remedied by an Order of the Local Government Board putting the Act into operation throughout the country. There would still remain other and more serious defects. The notification of stillbirths is far from complete even in those districts where the Act has been in operation for some time and efforts have been made to secure due compliance with the law. On this point the following paragraphs from the Registrar-General's Annual Summary for 1912 afford fairly convincing evidence.

Writing on the notifications recorded in London (p. xii) he observes:—

In addition to the notification of 103,708 live-born children (92·0 per cent. of the births registered) 2,593 stillbirths were notified, the latter being equal to 2·4 per cent. of the total, against 2·3 per cent. in 1911, 2·2 per cent. in 1910, and 2·3 per cent. in 1909, when the Act was only partially in force.

He goes on to compare (in a footnote) the foregoing proportions with those recorded in certain Continental cities where the registration of stillbirths is in force:—

It may be interesting to note that this percentage of stillbirths is generally exceeded in European towns. Thus, in the years 1909 or 1910, the proportion was 2·8 per cent. in Prague; 3·3 per cent. in Breslau, Stockholm, and Milan; 3·7 per cent. in Vienna and Munich; 3·9 per cent. in Dresden; 4·4 per cent. in Antwerp; 5·3 per cent. in Brussels; and in Paris, during the years 1896-1906, it averaged 8·6 per cent.

It should be noted that he calls attention to the fact that the definition of stillbirth varies in the countries mentioned; but, as will appear later, that observation applies to the last three only of the cities mentioned above. In the others the accepted meaning of the word is practically identical.

¹ At the end of last year the Act had been formally adopted by the Councils of 275 sanitary areas, comprising 22 Metropolitan cities and boroughs, 65 county and 79 non-county boroughs, and 88 urban and 21 rural districts. In 7 Metropolitan areas the Act was in force in virtue of an Order made by the Local Government Board under Sec. 3 of the Act, and in 10 non-county boroughs, 59 urban and 56 rural districts as the result of adoption by the County Councils of Worcester, Herts, Leicester and Durham. At that date the Act was not in force in 13 county and 159 non-county boroughs and in 656 urban and 574 rural districts.

Anticipating somewhat, it may be noted here that the Notification of Births Act does not provide for information of the causes producing the stillbirths, and that the information obtainable by inquiries from the Public Health Departments cannot satisfactorily make good that defect. This defect appears to make it impossible to rely on the Act for the information, the need of which is one of the principal arguments in support of the demand for registration.

III.

It is of no use to advocate the registration of stillbirths without a definite understanding as to the meaning to be attached to the term. It is therefore somewhat remarkable that in only one of the countries where such registration is required is any sort of definition included in the law establishing registration, and that is to be found in Ordinance No. 1, 1885, Section 3, in force in Ceylon. It is there enacted that "the term 'stillbirth' means a child born after the twenty-eighth week of gestation as dead, or apparently dead and not called back to life." It can scarcely be held that the foregoing phrase fulfils the requirements of a "definition." In most countries the need of a definition—for the guidance of the public—is obviated by enacting that all births, without distinguishing "live" from "dead" births, shall be registered, but such procedure does not get rid of the need of definitions for the guidance of the registration officers. Official requirements have been met by drafting Regulations.¹

Before passing to a consideration of the Regulations in force it will be convenient to advert to a misuse of the term "stillborn" which prevails in certain countries where children born alive but dying before registration (*déclaration de naissance*) are deemed to have been born dead. The countries where that practice prevails are Belgium, France, Holland, Italy, and Spain. In the first three countries the official returns of "stillbirths" include (a) children born prematurely and dead; (b) full-term children born without life; and (c) children born alive but dying before declaration of birth. In those countries three days are allowed in which to "declare" a birth. In Spain a child failing to survive the first twenty-four hours of extra-uterine life is counted as stillborn. In Italy, where five days are allowed for the declaration of a birth, a child born alive but dying before

¹ The Regulations are given *in extenso* in the Report of the Royal Statistical Society.

the declaration of birth is at law stillborn, but statistically the event is treated as a birth and a death. Evidently the mortality-rates at ages under one year published in Belgium, France, Holland, and Spain are not comparable with those of this country, and, judged by our standard, the former are understatements of the truth, as they exclude a considerable proportion of the deaths in the earliest days of extra-uterine life when the mortality is highest.

The "Infantile Mortality" Report issued by the Royal Statistical Society contains the Regulations in force for the guidance of registration officers in a large number of countries. Generally speaking, the Regulations are very vague and, from the standpoint of a "definition," most of them beg the question by referring to a stillbirth as the birth of a "dead child," without specifying any test of life or death. Only two sets of Regulations need be quoted here—viz., those in force in the Dominion of South Africa, and those drawn up by the American Public Health Association, which have been adopted by the Census Bureau, U.S.A.

SOUTH AFRICA.¹

"Stillbirth"—the delivery of a formed child which has not shown any sign of life after complete birth.

"Formed"—any foetus at any stage of development as to be readily recognized by any uninstructed person as a human child.

"Complete birth"—the body of the child is entirely outside the mother, but does not include either the division of the umbilical cord or the delivery of the afterbirth.

"Sign of life"—the child after complete birth has not been seen or heard to perform any physiological sign of life, such as breathing, crying, movement, pulsation, or the like.

AMERICAN PUBLIC HEALTH ASSOCIATION.

For registration purposes, stillbirths should include all children born who do not live any time whatever, no matter how brief, after birth.

Birth (completion of birth) is the instant of complete separation of the entire body (not in the restricted sense of trunk, but the entire organism, including head, trunk and limbs) of the child from the body of the mother. The umbilical cord need not be cut nor the placenta

¹ Strictly interpreted, these Regulations include births of non-viable children, and the scope of the Regulations therefore exceeds the provisions of the Registration Act, which requires the births of viable children only to be registered.

detached in order to constitute complete birth for registration purposes. A child dead or dying a moment before the instant of birth is a stillbirth, and one dying a moment, no matter how brief, after birth was a living child and should not be registered as a stillbirth.

The above quoted Regulations are good, but are capable of improvement. Before considering what improvements are desirable it will be well to consider very briefly—from a physiological standpoint—what it is that has to be defined.¹

In popular parlance, a “stillbirth” means the birth of a dead child, and it will be at once apparent that definite meanings are wanted for the words “birth,” “dead,” and “child.” It will be convenient to take the last word first.

From an examination of the information contained in the Report already referred to, it appears that the term “child” may include any foetus born after a gestation, varying from four months (in Japan) to full term. It seems useless to take cognizance (for registration purposes) of any child born before it has reached a development which will enable it to maintain an independent existence, which would exclude (in ordinary practice) all children born earlier than the twenty-ninth week of gestation. Such limit is also in agreement with the provisions of the Notification of Births Act.

The determination of the duration of pregnancy from an examination of a child's body is by no means an easy matter. It is a task beyond the capacity of a midwife, on whom, in the majority of cases, the responsibility of deciding between life and death in a new-born child at present rests. The difficulty can be obviated without material loss of accuracy by the adoption of a standard of length of body of the child. The length agreeing with the proposed inferior limit of gestation (twenty-eight weeks) is one of 13 in., or 32 cm. Such standard has the advantage of only requiring a tape measure for its determination, which anyone can apply. The measurement would, of course, be from the crown of the head to the sole of the heel, the tape being applied to the back of the child.

As the definition now sought is to be applicable to children at the time of birth—not for the purpose of determining at an interval after birth whether the child was born alive or dead—the term “birth” should be taken to mean the time when the birth is complete *qua* the

¹ The Report of the Royal Statistical Society contains a more extended discussion of the drafting of definitions of stillbirth and stillborn.

child, which will be on the completion of the second stage of labour when the child's body (the head, trunk and limbs) is outside the maternal body. At that moment of time the child is "born," inasmuch as the separation of the cord and the expulsion of the afterbirth are neither of them essential to the existence of the child.

The word "dead" being an adjective, it is necessary to find a definition of the corresponding noun "death," to complete the inquiry. "Death," however, is a negation, and hence appears to be incapable of definition in the strict sense of the term. The question, therefore, resolves itself into a task of finding some paraphrase of the word, or of prescribing some test of life, the absence of which in a given case shall be accepted as evidence of "death." The classic signs of life in a newborn child are movement and respiration (including crying). It is common knowledge that both of those signs may be absent at birth, and yet the child may be "alive." White asphyxia is a familiar instance of such an occurrence. Whether a child born in that condition can be "resuscitated" will depend on the vigour of the heart's action. Similarly, in cases of apparent drowning the success or failure of artificial respiration will depend on the vigour or feebleness of the circulatory system. With a few rare exceptions, when once the heart has ceased to beat the individual cannot be restored to "life"—that is to say, the other physiological functions cannot be renewed. It appears necessary that the presence or absence of the functions of the heart should be made the test of life or death at the time of birth. This conclusion is strengthened by the consideration that movement and respiration are impossible in the absence of the action of the heart. In other words, the classic signs of life are not primary but secondary indications. Their presence constitutes clear evidence of life, their absence is not complete evidence of death.

The foregoing considerations lead to the following definitions of "stillborn" and "stillbirth":—

A "stillborn" child means a child whose body at birth measures not less than thirteen (13) inches, or thirty-two (32) centimetres, in length, from the crown of the head to the sole of the heel, and who, when completely born (the head, body and limbs of the child, but not necessarily the afterbirth, being extruded from the body of the mother), exhibits no sign of life—that is to say, whose heart has ceased to function, as demonstrated by the absence of pulsation in the cord at its attachment to the body of the child, and the absence of any heart sounds or impulses.

Note—Crying and/or breathing being secondary signs of life, manifested only when the heart is acting, can be relied upon as signs of life, but the absence of either or both is not to be held to be proof of absence of life in the child.

A "stillbirth" is the birth of a stillborn child.

Comparing the suggested definition with the Regulations quoted above, it will be seen that those in force in the Dominion of South Africa require to be amended: (1) As regards the meaning of the word "child," which in its present form would include children born before they are viable; and (2), as regards the "sign of life." In this latter, although the heart's action is included in the words, "any physiological sign of life . . . pulsation or the like," the whole phraseology of the sentence places undue emphasis upon breathing, crying and movement, which are secondary, not primary, signs of life. The Regulations drawn up by the American Public Health Association contain no definition of the word "child" at all. The question as to what constitutes a sign of life is not dealt with in the Regulations quoted above, nor until quite recently was there any rule on the point. The matter was considered by the Association as late as September last, and the following resolution was then adopted:—

Resolved.—That the present Rules of Statistical Practice relating to stillbirths and premature births as adopted by the American Public Health Association in 1908 should be strictly followed by American registration offices, it being understood, in Rule 19, "No child that shows any evidence of life after birth should be registered as a stillbirth," that the words, "any evidence of life" shall include action of heart, breathing, movement of voluntary muscle.

The resolution, unfortunately, places all three manifestations of life on the same level, whereas a slight modification in the wording—i.e., "shall mean action of the heart with or without breathing and movements of voluntary muscles"—would have brought the amendment into line with the definition here suggested.

IV.

The last point for consideration is the form of registration which may be expected to give the most useful information. Incidentally it may be observed that the registration of stillbirths would afford a better measure of human fertility, indeed, the best measure available when taken with the data of registration of births in the absence of the notification of pregnancy which was advocated in the course of a discussion held during the recent International Medical Congress. The present proposal for registration is, however, put forward with another object—viz., the study of the causes of stillbirth and of early infantile mortality and ill-health. The “Infantile Mortality” Report of the Royal Statistical Society shows that the practice in those countries where such registration is in force is very diverse, some counting stillbirths as births only, others as deaths, and others, again, as births and deaths. Duplication of registration appears to be undesirable, and for the purpose now advocated registration as deaths is the only method which can be recommended. Stillbirths should be recorded in a special register which should provide for the entry of the cause of death. Such procedure would involve the production of a certificate signed by a registered medical practitioner. As many stillbirths are not attended by medical men, and as it would not be desirable to require inquests to be held with reference to such cases—they would probably be very numerous at first, at least—the appointment of public certifiers, or verifiers, of death, recommended as long ago as 1895 by the Select Committee on Death Certification, would become specially necessary. To prevent the illicit disposal of stillborn children the present law with reference to burial would require to be amended so as to prohibit the burial of bodies in any place other than recognized cemeteries. Further, the co-operation of undertakers would be required. It is a question whether they should not be licensed or registered, as they are in certain of the States of North America. The renewal of the licence or registration should be made dependent on the licencees conforming to the law.

V.

The discussion which is to take place really involves two questions, the one national (the need of making registration of stillbirths compulsory in this country), the other international (the desirability of arriving at an international agreement as to the meaning of the term "stillbirth").

The arguments in favour of enacting registration may be summarized in the following terms:—

- (1) The desirability of falling into line with other countries ;
- (2) The fact that additional information is required to discover how the present methods of checking infantile mortality, which have been shown to be ineffective at the earliest ages of extra-uterine life, can be supplemented ; and
- (3) The necessity of studying, with a view to finding means of remedying, the causes of infantile ill-health which result in enfeebled adults.

It has been urged that the definition of stillbirth is a condition precedent to registration and it is believed that the time is now ripe for an international agreement on that point. Until such agreement has been reached the international comparison of mortality statistics for the first year of life must necessarily be incomplete, and to a certain degree illusive. The question was submitted for discussion at the recent meeting in Vienna of the International Institute of Statistics, but it was thought that the subject was one for consideration by medical experts. The Institute formulated a resolution asking the international medical organizations to take the subject into consideration at an early date. The subject was also brought before the last International Medical Congress, but as the communication was a private paper, there was no discussion and no action was taken. The American Public Health Association had the matter before them in September last and adopted the following resolutions:—

That pending the possibility of international action, it is inexpedient to attempt more exact definitions than those contained in the present Rules (*quoted above*).

That the present Committee on this subject be continued by the Section on Vital Statistics, with request to keep the Section advised as to the progress made abroad and in this country and the possibility of co-operation in the adoption of additional Rules or the revision of the present Rules relating to stillbirths.

The time has come for action to take the place of discussion. In any efforts to secure the reforms here advocated the Royal Society of Medicine ought surely to take a prominent part. To that end it appears to be eminently desirable that this Joint Meeting should forward to the Council of the Society an expression of their opinion as to the desirableness, in the interests of preventive medicine, antenatal hygiene, obstetrical practice, and medical jurisprudence—

- (a) of securing the registration of stillbirths in this country ;
- (b) of formulating an official definition of the term “ stillbirth ” ;
and
- (c) of endeavouring to secure an international agreement as to such definition.

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DISCUSSION.

The PRESIDENT (Dr. Hamer) said he would like to ask Dr. Dudfield one question. When he said that the mortality from premature birth and congenital defects and malformations had increased during the last twenty years, it might be presumed that he meant us to understand that this was only a paper increase. Dr. J. F. J. Sykes some years ago laid stress upon the failure to demonstrate reduced death-rates in very young infants and upon the large part played by increase of mortality from premature birth and congenital defects in determining the maintenance of a high death-rate in babies less than a week old. It was possible that improved death registration in the case of very young children had come largely into question here. A century or two ago a death was often ignored if it occurred in an unchristened child, and Dr. McVail had shown that the small-pox statistics of Aynho were vitiated by the non-inclusion of deaths of children not only under 1 but even under 2 years. As in course of time registration became more and more perfected, younger and younger children were presumably swept into the registration net, and this fact might partly explain the phenomenon referred to by Dr. Sykes. Whether this was true or not the importance, from a statistical standpoint, of registration of stillbirths must be insisted upon.

Dr. W. S. A. GRIFFITH (President of the Obstetrical Section) stated that the necessity for the registration of stillbirths was fully established. It appeared to him that the system in force in the Dominion of South Africa was, on the whole, the best—namely, the registration of all recognizable *fœtuses* at any stage of their development. These might be divided into two classes: (1) Those presumably viable, measuring 13 in. or over; (2) those less than 13 in. *Fœtuses* under 13 in., born alive, as many are, would need to be specially recorded; and the duration of life as well as the length of the *fœtus* should be added. It might simplify some difficulties if the term "still-birth" were discarded in favour of "dead birth." The term "stillbirth," although in common use, was not generally understood, and the term "dead birth" could not be misunderstood. Whichever term was used must be clearly defined, and a definition must be scientifically accurate and at the same time sufficiently simple, so that it might be used by any person, without special instruction, whose duty it was to register. The difficulties of definition arose in attempting to combine the two. Dr. Dudfield's suggestion that the action of the heart should be the essential indication of life or death was scientifically accurate, but was often too difficult for the unskilled observer to determine; and it was not very rare for a baby born, apparently without heart action, to be put aside by a doctor or skilled nurse as dead and to surprise them eventually by beginning to cry, if its body had been kept warm, though without artificial respiration. Dr. Dudfield was quite correct in saying that crying, respiration, voluntary movements, were all evidence of life, and their absence

was not valid evidence of death. The next most important point was the estimation of the duration of the development of the foetus; that is, of the duration of pregnancy. Every medical man knew that this was often a very difficult and uncertain problem. It was common custom to describe this as of so many weeks' duration, as if it were possible, with any accuracy, to do so. It was quite easy to determine the number of weeks since the last menstrual period when the patient was able to give that date, but pregnancy might have commenced any day between that and the date of the following period, and while careful observation generally enabled us to determine the month of pregnancy, the number of weeks must often be very uncertain. Many women also became pregnant during periods of amenorrhœa due to various causes. Falsification of the duration of pregnancy as well as mistakes of calculation would be easily made and difficult to discover, while gross falsification of measurement would be liable to detection. An arbitrary measurement of the foetus had clear advantages—it was easily ascertained by anyone—and no one should be allowed to bury a foetus without verifying the measurement and seeing that it was registered if it was of the required length.

Dr. T. H. C. STEVENSON congratulated the author of the paper on his useful and luminous summary of the position of the question of stillbirth registration in this country. He agreed with what the Chairman had said as to the probability that the increase in mortality from premature birth and congenital malformations was at least to a large extent factitious, but differed somewhat in the explanation he would suggest. While it was probable that there was some decrease in the practice of registering early deaths of premature infants as stillbirths, which would account for a portion of the increase in mortality from prematurity, he thought the chief explanation must be sought elsewhere. There was reason to believe that throughout the whole of the period reviewed in the paper registration of births had been practically complete. Mortality attributed to the indefinite heading "atrophy, debility and marasmus" had, however, been decreasing, as precision in certification increased, throughout this period, and it was by transfer of mortality from this heading to prematurity and malformation that he thought the increase in the latter was largely to be explained. Little need be said as to the case for registration of stillbirths, as there seemed to be something very like unanimity of opinion in its favour. He assumed that when Parliament passed the Notification of Births Act, including stillbirths in its scope, it committed itself to the principle of official cognizance of stillbirths, so it might probably be taken for granted that any comprehensive revision of the law of registration, such as was even now overdue, would include this proposal. With regard to the question of registration of stillbirths of less than twenty-eight weeks' gestation, as suggested by the last speaker, he had considerable sympathy with the proposal but thought that this country in entering upon a policy of registration long pursued by most others would probably be well advised not to attempt to carry it further at first than it was carried elsewhere. The question of exten-

sion might be considered at a later date when the less ambitious scheme proposed in the paper had been for some time in successful operation. If twenty-eight weeks were to be accepted as the early limit for registrable stillbirths, the question arose as to how the birth of a living child at a less advanced stage of pregnancy should be dealt with. Presumably, in such cases, the child did not long survive, and he understood that in Germany such live births were excluded from the registers. This course seemed to him but logical, as it would be most undesirable, when live and stillbirths were both being registered, not to make the conditions similar for both. If, however, it were possible, as he thought it should be, to ascertain the period of gestation at which birth had occurred, or the length of the child, in the case of all deaths occurring during, say, the first week of life, this information would afford a means of surmounting the difficulty, for in the comparison of still and live births the number of the latter occurring before the twenty-ninth week would be known, and could be excluded from the comparison. One question which would have to be decided at the General Register Office if stillbirths were made registrable, was the extent to which it would be desirable to carry the attempt to ascertain and tabulate the cause of death in these cases. No doubt in a large proportion of cases this would not be ascertainable, but that fact did not seem sufficient reason for refraining from tabulation of such information as it might be possible to get. He presumed that in all cases it should be possible to get a statement whether the foetus died before or during labour, and whether it was macerated. He would greatly welcome an expression of opinion from any of the obstetricians present as to the usefulness of this information and whether there were any other points on which information might be expected in all cases, as apart from the class of information which could only be looked for in a proportion of certificates returned by medical men.

Dr. FRED. J. SMITH remarked that in his opinion there was no possible sign of a "stillbirth" which could be completely observed in a moment. He said that circulation and respiration might both be in abeyance for a period of time to be reckoned certainly by seconds, and possibly by minutes in the newly born, and that therefore (except of course in case of putrefaction *in utero*) to determine the fact of actual death the child *must* be watched for some minutes while attempts at resuscitation were being made. Considering, then, the definitions of "stillbirth," or "sign of life," he preferred that adopted in South Africa: "The child after complete birth has not been seen or heard to perform any physiological sign of life," and the "delivery of a formed child," formed being defined as "any foetus at any stage of development as to be readily recognized by any uninstructed person as a human child." He ridiculed the idea of an undertaker trying to estimate either the uterine age of a foetus, or indeed measuring its length, when 'crime' or 'no crime' might depend upon $\frac{1}{8\frac{1}{2}}$ in. in measurement. He went on to say that to be logical, therefore, and indeed to get facts which might be of use from a preventative point of view, every miscarriage of whatever stage of development ought to be

registered and recorded, though this would involve a good deal of very delicate consideration by the profession and possibly would have, so far as the first three months' development were concerned, to be made voluntary and not compulsory. He was glad to hear Dr. Griffith ridicule the possibility of the rigid determination of the age of a foetus and the duration of pregnancy.

Dr. G. S. BUCHANAN considered that a good case had been made out for Dr. Dudfield's propositions. If carried into effect, they should enable statistics to be obtained which would be more or less comparable as between the United Kingdom and other countries and between special localities, and in course of a sufficient number of years such statistics might yield very valuable information. Besides this, general notification of stillbirths might help to some extent in obtaining exact knowledge of the causes of stillbirth. If, however, it was desired that these should be studied minutely, and classified according to causation—faulty midwifery, syphilis, lead, and so on—it would be better not to rely upon massed information obtained by different observers using different standards. At present in most parts of the country, including nearly all large towns, information as to stillbirths can be obtained by the public health authorities through the operation, or enforcement, of the Notification of Births Act and the Midwives Act, and the way to investigate the cause of stillbirth in a locality would seem to lie in taking the information which is already available and getting a satisfactory research undertaken on a consecutive local series, which could be examined from all points of view and in a comparable manner by those who undertook the investigation. Apart from its being a means of obtaining knowledge, notification of stillbirths had been suggested as an important means by which direct administrative action could be undertaken to diminish the occurrence of stillbirths and to prevent the conditions which led to the death of infants within a few weeks of birth. Its importance from this point of view was, perhaps, open to doubt, as it would seem more logical, from the preventive point of view, not to wait till the foetus or the infant was dead, but to deal with the pregnant mother. This course, if strictly pursued, would seem to lead, if not to the notification of pregnancy which had been suggested in some quarters, at least to the provision of municipal aid, by clinics and otherwise, to the pregnant woman.

Dr. AMAND ROUTH would value registration of stillbirths for several reasons: First, because of the statistics which such registration would afford. This would be still more complete and reliable if all abortions were notifiable also, for the exact number of potential lives lost during antenatal existence would then be known. Dr. Newsholme, Medical Officer for the Local Government Board, had shown him a statement of the stillbirths notified under the Notification of Births Act, 1907, and though in London it was only 2·46 per cent. of live births for 1912, it was 2·98 per cent. in the seventy-four large County Boroughs and towns now under the Act, and 3·34 per cent. in the sixty-seven smaller towns. It might, therefore, be held that the stillbirth percentage was

about 3 per cent. in England and Wales. In a recent lecture on the subject¹ he had shown that the most moderate estimate of the proportion of abortions to stillbirths was four to one. This would make the total of antenatal deaths in one year about 100,000, rather more than the average infantile deaths of the survivors in their first year of life, and represented a loss of 200,000 deaths during the nine months of intra-uterine existence and the first year of life. Inasmuch as the survivors of this double mortality in 1911 were only 782,362 (not four times as many as the previous deaths) the annual loss to England and Wales was enormous. The second reason why registration of stillbirths would be valuable was that by its introduction means could be found by which every stillborn child and placenta would be retained for scientific examination, and the cause of death ascertained. The third reason for registration was that indirectly treatment to prevent this antenatal disease and death could be instituted, not only as regards the subsequent pregnancies of the mother concerned, but of similar diseases in other pregnant women. If the State could use some of the money now in their hands, and earmarked for research, in the formation of centres for research in antenatal pathology, a vast amount of good would be done, both in increasing the birth-rate and adding to the health of mothers and children. Efficiently to carry out such subsequent treatment medical supervision of pregnant women was essential. Possibly all these results could be obtained by *notification* to the Medical Officer of Health of the births of every "formed" foetus, and by *registration* of stillbirths when 13 in. long, or after twenty-eight weeks of gestation. If stillbirths became registrable, the practitioner's certificate giving the cause of the stillbirth should be a secret one, otherwise such causes as "congenital syphilis" might be entered as "debility, marasmus, premature birth, constitutional disease, &c.," for fear of the disastrous effect of such a statement upon the parents' happiness and mutual respect.

Dr. W. A. BREND said that although Dr. Dudfield appeared to be urging only registration of stillbirths, his proposals really went a great deal further. The object aimed at was to acquire more knowledge of the causes of stillbirth and the circumstances under which they occurred. It was clear that the mere act of formal registration would not give that. When a medical man had been in attendance at the birth, information might be forthcoming; but a large proportion of births were attended by midwives only, and in these cases additional examination by an expert would be necessary. Dr. Dudfield had realized this, and proposed to appoint public certifiers or verifiers of death, but he had given no details of the duties these persons were to perform, or of the way they were to discharge them. Nor had subsequent speakers examined this far-reaching suggestion. The late Mr. Troutbeck urged that death verifiers should be appointed to examine the body, and make inquiries in the case of every death, whether the practitioner who had been in attendance was willing

¹ *Brit. Med. Journ.*, 1914, i, pp. 355-63.

to certify or not. If Dr. Dudfield's proposals went as far as that, and there was no indication in his paper that they did not, then they demanded more consideration than had been given to them that evening. The public would probably resent the intrusion of a stranger into the death-chamber, and the interrogation of relatives and others, purely for the sake of getting scientific information; medical practitioners would also object to having their treatment and diagnosis revised by a State official. In the special case, even if death verifiers were appointed, it was not easy to see how they would obtain useful information. The procedure would be, presumably, that the stillbirth was reported by the midwife in the first instance to the registrar or medical officer of health, and by him to the death verifier, who probably would not arrive on the scene until the following day. What investigation could he make? He would find simply the dead body of the infant, and, in many cases at all events, he would not even be able to verify that it had been stillborn. The only possibly useful proceeding would be to make a post-mortem examination, and that was undesirable without the authority of the coroner. Dr. Brend agreed that the present method of disposing of the body of a stillborn child was unsatisfactory, and that there should be a special register of such births. But, to start with at least, he was disposed to accept the statement of the midwife. If in any case there was reason to doubt the fact that the child was stillborn, the matter should be one for inquiry by the coroner.

Dr. BLACKER supposed that the main reasons for advocating the registration of stillbirths were the collection of statistics and the furtherance of our knowledge of the various causes leading to the death of the foetus. Such statistics would of course be very interesting, but he did not think that they would be of much value to the clinical obstetrician, nor indeed did he think that much would be gained from the pathological point of view by the registration of stillbirths. Indeed, it was rather a case of putting the cart before the horse. Even if they were informed that a pregnancy had ended in the birth of a dead child, that information often gave them but little assistance, for the foetus was in most cases too badly preserved or had been dead for too long a time to enable them to draw any accurate conclusions, either as to the condition producing its death or how best to prevent such an occurrence in future pregnancy. If they were ever to practise effectively preventive medicine in the case of the pregnant woman, and to carry out the treatment of antenatal diseases, then they must demand not the registration of stillbirths, but the compulsory notification of pregnancy. The notification of pregnancy would place them in a position to study the course of the various conditions which might result in the premature termination of the pregnancy, and would enable them to acquire some certain knowledge of antenatal diseases, and to undertake the treatment of both the mother and her unborn child with some hope of success. Their ideal as obstetricians should be not the collection of statistics of the frequency of stillbirths, useful as this might be, but the prevention of such stillbirths, and this could only be accomplished when they were

in a position to supervise every pregnant woman throughout the whole of her pregnancy. No doubt this was an unattainable ideal at the present time, but it was one worth striving for and one which as obstetricians they should lose no opportunity of attempting to bring about. He certainly agreed with Dr. F. J. Smith when he said that it was possible for a fœtus to be born with no signs of cardiac activity to either palpation or inspection, and yet for it to be resuscitated by appropriate means and to survive.

Dr. DUDFIELD, in replying to the discussion, agreed with Dr. Stevenson in thinking that the more complete registration of births had little or no part in causing the increase in mortality from premature birth and congenital defects. He (the speaker) thought that there had been, in all probability, some transference from the very indefinite rubrics—such as “atrophy, debility, and marasmus”—to the slightly more definite rubrics already mentioned. He thought it would be useful to measure such transference. It might be advantageous to find, as Dr. Griffiths had suggested, some term in substitution for “stillbirth,” although the latter had the advantage of being good Anglo-Saxon in origin. “Live born” and “dead born” appeared to be somewhat awkward, and were difficult to defend etymologically. The latter term was the literal translation of the French designation *mort-né*. He recognized that breathing and crying were signs recognizable by any onlooker, even the most uninstructed, at a birth, but there would always remain a proportion of births in which those signs were absent. The responsibility of deciding whether the child were alive or dead would then rest on the person (doctor or midwife) conducting the labour. The days of the half-instructed midwife were past, and he failed to see why it should be impossible to instruct midwives so as to make them competent to rely on the “heart test.” After all, his suggested definition did no more than provide an ultimate test of life when the classic signs were wanting. Dr. Griffiths had referred to the arbitrary character of the standard of viability. No doubt the standard was arbitrary; but that quality would attach to any standard, as exceptions would almost certainly be forthcoming. The standard proposed had the advantage of agreeing very closely with actual practice in induced labour, and was, moreover, the rule in the majority of foreign countries. The objection from a statistical point of view to the South African regulations describing a “stillbirth” (preferred by Dr. Smith) was that these included non-viable children, who could not be regarded as assets *qua* population. In relation to the study of fertility such extension would undoubtedly be useful, and it would help to the elucidation of the causes of antenatal mortality. He was of opinion that, taking all the pros and cons into consideration, such extension was to be deprecated. Dr. Routh had referred to the difficult position of practitioners who would find themselves called upon to certify stillbirths as due to venereal disease. That difficulty was not limited to stillbirths or to venereal disease. In his (the speaker's) opinion, the only way of obviating such difficulty was to make the certificate of cause of death a confidential document, which should not be handed to the

relatives nor disclosed to the local registrar of deaths. Such practice prevailed in Switzerland, where the cause of death was reported in a specially endorsed letter direct to the Central Statistical Bureau. Dr. Brend had questioned the advisability of appointing verifiers of death partly on the ground that the public would resent their visitations, and partly because their work would infringe the prerogatives of the coroners. In reply, he (the speaker) wished to call to remembrance the fact that such appointments were strongly recommended by the Select Committee on Death Certification in 1895. Since that date a Bill including provisions for appointing death verifiers had been introduced every Session as a private measure. Under that Bill the verifiers would act only when no medical practitioner had been in attendance on the deceased. It was intended that the verifiers should act in concert with the coroners, not independently of them. For the purposes of the Cremation Act a second certificate was required, and his experience of work under the Act had not disclosed any resentment on the part of the relatives against the verification. In the case of stillbirths the verifiers would be able to obtain evidence of the cause of death by inquiries into the medical history of the pregnancies. The notification of pregnancy at the present time appeared to him to be quite outside the range of practical politics. What line public opinion would take in the future on such a suggestion it was impossible to forecast. Having regard to the high degree to which the public had been educated with regard to notification generally, it was conceivable that at some distant date notification of pregnancy might come to be regarded not merely as a duty imposed by law, but as one to be carried out as part of the normal functions of citizenship.

In conclusion, he desired to emphasise two points: The first was that any legislation on the question of stillbirths should not attempt to provide for exceptional cases, but must be framed on lines which would have a quite general application. The second point was that public opinion required to be educated to regard stillbirths as much a waste of human life as infantile mortality was now held to be. He did not intend that observation to be taken to mean that every stillbirth inevitably implied the loss of a potential citizen, but he did wish to press the view that a proportion of stillbirths were absolutely preventable, and that it was incumbent on the public to see that proper measures were taken to obviate that waste. He hoped that the Council of the Society would give the whole question their best consideration.

Section of Epidemiology and State Medicine.

February 27, 1914.

Dr. W. H. HAMER, President of the Section, in the Chair.

Malaria in Cyprus and Greece.¹

By Sir RONALD ROSS, K.C.B., F.R.S.

I PROPOSE this evening to show you some lantern slides illustrating a trip which I made in the early part of last year, when I was sent by the Colonial Office to advise about the prevention of malaria in Cyprus.

Before dealing with the two places which I shall speak of particularly, I will say something about the results of preventive measures in several parts of the world. That the parasites of malaria are carried by mosquitoes was discovered in 1899. I show you a chart of the first results obtained in Hong Kong. The fall in the malaria-rate which you see given in the table was produced almost entirely by what the engineers call "training" the nullahs or streams; in other words, the streams were conducted along smooth channels, so as to do away with the mosquito-breeding pools of still water which formed by the side of the streams in their former condition. That improvement in Hong Kong has been maintained. There was a recrudescence three years ago, but that was rendered only temporary. We cannot expect to get rid of malaria in Hong Kong entirely, because there is always such an immense influx of Chinese from outside the town. The returns of deaths among the Chinese are, of course, open to error, but the numbers are fairly well

¹ A lecture given to illustrate a demonstration of lantern slides. (Abstract of shorthand report.)

attested. Dr. Clarke, the able Health Officer of Hong Kong, shows similar charts since then. Next you see the deaths from malaria—not from yellow fever—for the same years in Havana. These latter are not so well vouched for, but still, you cannot help feeling that there was immense improvement under the régime of Colonel Gorgas. Yellow fever having been shown, at the end of 1900, to be carried by mosquitoes, the Americans set to work and reduced the mosquitoes in the city of Havana; a marked fall in malaria ensued. Havana is a crowded city with some 250,000 people, and the improvement in the health was very striking. I now come to what was done in Ismailia in 1902. Ismailia, as you know, is on the Suez Canal, not far from Cyprus. It was intended to be the capital by Ferdinand De Lesseps; but years ago, when they dug a fresh-water canal, malaria commenced. It was a desert city, and had to be supplied with fresh water, with the result of the entry of malaria, and by 1900 it had become a veritable scourge. Then efforts were made by the Canal Company to reduce the disease by means of quinine, which was dispensed very freely all over the place. That failing, in 1902 they asked me to go out and advise if anything could be done by any other method. I went with Sir William McGregor, then Governor of Lagos, and we found the breeding places of the malaria mosquitoes. There was an immediate and rapid fall in the malaria-rate after the mosquitoes had been attacked. The canal opens into a salt-water lake, Timzah, and there is a fresh-water canal discharging into the lake, which is the cause of the malaria. Mosquitoes do not breed in the canal, but, as a result of the canal, the water leaked out and formed marshes, and these marshes were the breeding places of the Anophelines. In addition there were a number of Culicines, which do not carry malaria, breeding in the cesspools under the houses. The mosquitoes were banished with great rapidity, and Dr. Pressat, the medical man who was entrusted with the work, declares he reduced the malaria of that town with a working gang of only four men. I can quite believe it, because the breeding places were so few. The town is in the desert, with no rain at all for long periods, and hence it is an easy matter to reduce its mosquitoes. There are a large number of other towns where it is probably as easy. Nearly the same state of things prevails in parts of Cyprus, where mosquitoes breed in similar small marshes. It was easy to fill up some of them, and to “train” others. These insects breed only in the very shallowest pools of water, $\frac{1}{2}$ in. or even $\frac{1}{4}$ in. deep, flowing over a little water-weed, and are destroyed by allowing the

innumerable minnows to get at the larvæ. When we went there, mosquitoes were so prevalent that we were almost lifted off our chairs by them; at Ismailia they were in swarms. But immediately afterwards the French reduced them so much that the children are now allowed to sleep without the protection of mosquito-nets. I have twice been there since, and malaria has been entirely banished. In this statistical table you will see the record. There are the usual fluctuations, which are of great interest from the pathometrical point of view. You see that the average amount of malaria at Ismailia remained extremely high until 1902. Then note the successive big drops. Since then there has been no indigenous malaria in that town. Though a small one, it was an ideal campaign, and if it could be repeated in other parts of the world, the results would also be good.

The next slide shows another campaign, which was conducted by Dr. Malcolm Watson in the Federated Malay States. Two towns were drained, Klang and Port Swettenham; and the result of the effort was extremely well marked. In the surrounding district there was no fall in the number of malaria cases. The deaths are classified, first those due to fever, then those due to other diseases. For the towns the fever deaths fell rapidly, and those due to other conditions too. But in the cases from places other than the two towns the deaths mounted up as the hospital became more popular, and so did the other deaths—showing that the reduction of malaria reduces the general death-rate. This has been amply verified by other figures, notably some from India, where totals are given from malarious contrasted with those from non-malarious villages. In Mauritius, the total death-rate was 30 to 40 per mille; but in the non-malarious places, such as the Seychelles, it is only about 14 per mille, almost as low as the death-rate for London. I do not attribute the whole of the difference in the death-rate to malaria, but a good deal of it is due to that. So if you remove malaria you improve the general death-rate. Malaria is a long-continued and troublesome disease; the patients are constantly relapsing, and it affects the health of all who are attacked by it.

With regard to the infected children in the towns and country districts respectively, in Klang at this period only one child out of 173 was affected, whereas in the country districts one-third of the children suffered. As a general rule, half to one-third of the children will be found affected. Before malaria was banished the sick certificates amounted to 1,026; after banishing malaria the numbers were 71, 30, and even less.

The next chart is of Panama, extending over four years, at the beginning of the operations. Malaria is always present in Panama, especially as a large number of people live outside the protected areas. The great fall in the admissions is striking.

Having described what happened in these important campaigns, I will go on to speak of Cyprus. There are a number of towns of interest : Famagusta, the capital Nicosia, and Limasol. They are all small towns, and the capital has only 10,000 or 11,000 people. There are innumerable valleys, and a great undulating plain between two ranges. The British have made a number of irrigation works and tanks, and in addition to that irrigation there are several perennial streams. It is interesting to note the disposition of the rainfall. There is a fairly heavy rainfall in the winter, up to January. In February it begins to fall off, and in March there are only a few showers. In April, May, June, July and August there is scarcely a drop of rain, and rain begins to fall again in September. You may gather from that, the facilities that there are for the Anophelines ; they require a warm temperature, as well as water, and most of the rainfall is concurrent with the cold months. I went there at about this time last year, to see when the breeding begins, that being the most important strategical point to deal with. It was only just beginning in March, the water before that time being much too cold. At that date the rains were beginning to cease, but there were pools of water, both in the river-beds and high up. We found a considerable number of Anopheles in the water, which had escaped from these irrigation works. Some of the principal breeding places in Cyprus were the waters which escaped from the village water supply. Each village must have a water supply, and some of the water is brought into old cisterns, and there allowed to run to waste to some extent. This waste water forms small marshes in which larvæ can easily be found. Another source of breeding is the wells in the villages, in which Dr. Williamson, of Cyprus, found them.

The way to measure the amount of malaria in a place is to take the " spleen-rate " of the children. The children are taken between 3 or 4 and 15 years of age and examined for splenic enlargement. Where the spleen-rate is only about 5 per cent. the rate of malaria is low ; even where it is 10 per cent. the rate is considered low. In some places in Cyprus it reaches even 100 per cent. In Famagusta there is a spleen-rate of 20 per cent. and over, due, I think, to small

leakages more than to anything else, as well as to the wells among the crowded populations. There are fourteen factors concerned with the malaria question, all of which have a bearing on the cases. I show you a view of one of the large irrigation tanks. My object, of course, was to find out their effect on the prevalence of malaria. I expected to find large numbers of the Anophelines there, but this was not the case, because the fish can get at them too easily. I have no doubt that at a later season of the year it will be more easy to find them, as the waters sink lower. There is an escape of water from the lake I show you, and in it we found a large number of Anophelines breeding. The village behind is full of malaria; 100 per cent. was the spleen-rate among the children. It is necessary to remain there to study the breeding conditions accurately. I had only one month to spend in the island, and so I could not study it exactly.

We now go west from the large irrigation tanks to Nicosia, which contains 11,000 or 12,000 people. The only breeding place I saw was a little marsh outside the walls; here water has been allowed to run to waste outside the town, and is a prolific breeding ground. It is an exquisite spot, full of trees, but full also of Anophelines, and other noisome insects. In these few breeding spots, perhaps, all the Anophelines in the town were bred. The spleen-rate in the town, however, is very low. I show you the photograph of a little boy, from Algiers, with a very large spleen; it is not a kala-azar spleen, but true malaria. In Cyprus the spleens are not so big as these. Here I have to thank Dr. Hamer and the Medical Officers of the County Council for their assistance in allowing Major Christophers, Major Perry, and myself to study the spleen-rates in the heart of London. This was important, as we wished to set a standard, so that it might be known exactly what is an enlarged spleen; whether a spleen that is palpable is an enlarged one, or not. Some people think that if one can just touch a spleen under the ribs it need not necessarily be a pathological enlargement. But we determined, by our studies in London, that it was so. If you can feel the spleen in over 2 per cent. of the children, you may pretty safely conclude it is pathological. This standard has not been set before, and it is a useful figure. In Cyprus, when we could feel the spleen under the ribs we regarded it as an enlarged spleen.

North of the capital is the Cythrean stream, running through a most beautiful district, and it is of great interest from the point of view of

malaria. It is a stream only a yard across, and during summer and winter the volume of it is not changed. The natives say that it comes from under the sea, from the mountains across the sea. It is used for irrigating the ground. You would expect to find a high spleen-rate here, but the medical officer and myself found a very low one, only 5 per cent. The reason is that the natives know how to use every drop of water in the stream; it is so precious to them. The water is turned on to one field after another, until all have been served; none of it was allowed to go to waste and form puddles.

We go farther to the northern coast of Cyprus. You can see in this photograph the coast sloping down to the sea. In this village the spleen-rate is very low because no pools can form there, owing to the steep declivity. It is not till you get right down to the coast that you find the rate rises. Here is the town of Limasol. It is not a big town, and I do not know that it is very prosperous; but it is fairly beautiful with minarets and towers. I show you a marsh half a mile from the town which is responsible for nearly all the malaria. The spleen-rate in Limasol is high in the part of the town which is close to the marsh, but farther away is very low. Even in a $\frac{1}{4}$ in. of water over the mud we find the larvæ; and this is the most suitable kind of place for them. There are also holes in the ground which have been made by herdsmen for watering their cattle. The Municipality have made a breeding place closer to the town, in the escaped water from the water-works for the town. We took the Mayor and others concerned in the government of the town to see these places, and I hope that, as a result, something will be done.

We now come to Paphos, the place where Venus rose from the sea. We found here a stream breeding large numbers of Anophelines. The water should be trained in such a way that it will not breed mosquitoes; but there is always some difficulty—people have prospective rights over the stream, or the Government cannot find the money; though money will be readily forthcoming for building a new post office or something of that kind. Festering puddles are thus allowed to remain for years, because there is a quarrel as to who shall find the money to do away with them. Close to this place is a famous pillar, where Paul and Barnabas were supposed to have been whipped. The Temple of Venus is shown close to where she rose from the sea.

My report on Cyprus has been published by the Colonial Office, and I think the Government will deal with this large question. It has a

very able High Commissioner in Sir Hamilton Goold-Adams, and all the officials are very anxious to reduce the incidence of the disease. The question is, as usual, finding the funds to allot to each village; the villagers want the Government to do it, and the Government want the villagers to do it, and between them nobody does it. I hope that will not be the story of Cyprus. There the disease is quite a serious matter. The spleen-rate averages 21 per cent., and it is a very high rate for a European country, though not as high as Mauritius, where it was 33 per cent. But Cyprus has a temperate climate and is inhabited by white people. The death-rate, however, for the whole island is recorded as only 17 per mille—which suggests that the statistics are not to be relied upon. I may say that there was no Sanitary Department. The Medical Department, however, was very active and very efficient. I hope there will soon be a regular sanitary department founded. The principal difficulties in dealing with the malaria occurred in the breeding places of each of the villages. In some, these breeding places are very small and could easily be dealt with; in other places the breeding places are much more extensive, and would cost much more to get rid of. In addition to removing the breeding places, quinine can, of course, be given. Protection by wire gauze put up to the windows, such as is advocated in certain places in Italy, is hardly possible for the poor people in the villages; moreover, the expense would be greater than getting rid of the breeding places. Cyprus is almost an ideal place for mosquito reduction, better than Panama, and better than the Federated Malay States, because of the smallness of the rainfall. Therefore, we ought in Cyprus to have a good vigorous mosquito-reducing policy, in addition to the use of quinine. I feel certain that all these methods will be adopted.

We now pass on to Greece, where the problem of malaria is of great interest. Greece, as you know, is a mountainous country cut up by numerous valleys. The peculiarity of the malaria is that it lies along each valley, and that is why it has been so damaging to the country. Wherever people can live, that is to say, close to the water, there malaria is prevalent. Athens has escaped because there have been but small breeding places, and the climate is dry. Farther north is the Copaic Plain, where I went in 1906 to advise a company regarding the reduction of malaria. Mount Helicon leads down to the Plain, and you can see Mount Parnassus. There used to be a lake here which was drained by the ancients, and cultivated. In recent times it became a

marsh, which was drained by a French company. Finally it fell into the hands of an English company, which now works it beautifully. It is cultivated all over, and provides vegetables and crops which are sent all over Greece. But there is a terrible amount of malaria. The streamlets breed large numbers of Anopheles. Here is a borrow-pit of the railway; railways frequently make these breeding places. I went through the places again after seven years' absence, and all except one of the puddles were still there. It would be far better to remove these puddles than spend considerable sums of money in giving the people quinine. But there was a marked fall in the spleen-rate, and the place was much healthier. Before my first visit an anti-malaria league was started by Dr. Savas and Dr. Cardamatis, and later we collected £500 for it in England. It induced the Government to issue a quinine certified to be good; previously the quinine powder supplied was half flour. It is now excellent, and is distributed in large quantities, and a profit is made by the Government on the sale of it. (It is unusual for governments to make profits on their sanitary measures.) But there is very little money expended for draining pools. There is more rain in Greece in summer than in Cyprus. That is why Greece is more malarious than Cyprus, and more so than Italy. We found about 50 per cent. of the children affected in Moulkie. Six years later the spleen-rate had fallen to 20 per cent. Here is Livadia on the shores of the lake, where the wonderful oracle of Trophonius, an ancient medical oracle, was situated. There is very little malaria in that village, though the lake extends almost to the foot of it. If we examine the statistics of malaria in Greece years ago, we find the estimated number of deaths was 6,000 per year; but this has now been much reduced.

The next slide shows the work done in the stream of Ilissos at Athens. Here is a stream only a few yards wide. In the summer there are always a number of pools which make good breeding places. The insects were affecting the troops in these barracks, and causing much trouble among the children. This was dealt with by training the stream. You see first the untrained stream, full of puddles, and then the trained stream. To be done properly it should be lined with masonry on both sides, but the capital is not forthcoming for this; so more money has to be expended in dealing with the stream every spring. A large number of children were affected, as examined by the Greek League. At first the sick-rate was 92 per cent., but after the

training it fell to 58 per cent., 21 per cent., and then to 2·6 per cent. Since then it has been practically abolished.

Malaria in Greece is a matter of great interest, it being a question as to how far malaria actually checked civilization in Ancient Greece; this question has been gone into thoroughly by my friend Mr. H. W. S. Jones.

DISCUSSION.

The PRESIDENT (Dr. W. H. Hamer) said he was sure all those present had been greatly interested in the very interesting lecture, and the slides exhibited to illustrate it. There would naturally be some questions which members would wish to ask. He himself had been particularly struck by Sir Ronald's remark about the "fourteen factors" which entered into the malarial equation. In the case of that particular disease the lecturer was, of course, dealing with factors concerning which something was known; the remark was interesting, none the less, to those who were thinking about our own endemic diseases, in the case of which but little was known about the corresponding factors. Recently he (Dr. Hamer) read a letter of Sir Ronald's, in which mention was made of the "flare phenomenon," which he had studied in connexion with malaria. That phenomenon was of profound interest also in connexion with diseases affecting London people, such as measles and influenza. The regularity of occurrence of this "flare phenomenon" in such a disease as measles, for example, was an exceedingly remarkable thing. Thus, during each of the last few weeks there had been only a hundred or two cases of measles in the whole of London, and yet it was well known to students of epidemiology that in a few months' time thousands of cases of that disease would develop in each week. It might be urged that this was no more remarkable than that crocuses should come up in February. But it was really much more remarkable, for the "flare phenomenon" of measles was not a mere question of season; it occurred, indeed, at widely differing times of the year. When one attempted to form in one's mind some sort of idea as to the nature of the alteration in the present condition of children in London, as contrasted with the condition obtaining, say, in a few months' time, one's knowledge was wholly at fault.

Lieut-Colonel A. M. DAVIES desired to add his expression of thanks to the lecturer for his interesting description. In 1882 it was proposed that Troodos should be a health resort for the troops. Some did go there for a few seasons, and he could never understand why it was discontinued, as it was only a few hours' sail from Alexandria. Perhaps financial considerations were the reason. He thanked Sir Ronald for his successful and interesting photographs, and congratulated him on the happy mingling of scientific research and

its practical application for the benefit of the health of the people, with an opportunity for studying and enjoying the scenes of natural beauty and archæological interest, of which he had shown them pictures taken with his own camera.

Fleet-Surgeon BASSETT-SMITH, C.B., said he had never visited the part of the Mediterranean dealt with in the lecture but he was greatly interested in the subject of the prophylaxis of malaria. Sir Ronald Ross had placed that before the profession in a way such as no one else was able to. The mosquito campaign was of vast importance in all places where malaria was rife. Dr. Watson's work in the Malay Peninsula, which had been referred to, was a vast undertaking, and proved quite a successful one. Mauritius, also spoken about by Sir Ronald, showed particularly how important the mosquito was. In the old days Mauritius was healthy, and then by the introduction of the Anopheline, the carrying mosquito, it had become one of the most intensely malarial countries in the world, and there was a high spleen-rate among the inhabitants. If Sir Ronald had brought home to the Government the importance of spending time and money to carry out preventive measures, instead of wasting money on useless objects, nothing better for the places concerned could have happened.

Mr. MAJOR GREENWOOD, jun., said he also would like to "draw" Sir Ronald on the subject of the fourteen factors which he had referred to elsewhere, because one of the points the lecturer raised was so extremely interesting in connexion with diseases which members knew more about in this country. To repeat the contention raised by Sir Ronald Ross in the *British Medical Journal*, it amounted to this: he had clearly demonstrated, in the case of malaria, that when one of the factors reached a certain critical value one might expect a rapid increase in the prevalence of the disease, and that, provided it were below that critical value, epidemicity did not arise at all. The President had just pointed out that in measles there were periods of intermission, and there were sudden "flare-up" phenomena. The problem which needed investigation pathometrically was as to how far in this disease it was a question of mediate phenomena or communicating means which reached a certain level, and how far the stress of the change fell on the organism itself. Members of the Section would remember Dr. Brownlee's paper in which he explained the course of an epidemic on the hypothesis that the essential *materies morbi* acquired, perhaps by way of a "sport," a high degree of infectivity, and that that high degree fell off in accordance with a well-known mathematical law. It was a consequence of Dr. Brownlee's hypothesis that the ideal epidemic curve should be a symmetrical function. Many epidemics, of which the statistics were fairly accurate, were not of that directly symmetrical form. Dr. Brownlee proposed various ingenious modifications of his original hypothesis to account for the asymmetry of those epidemics. His (Dr. Greenwood's) investigations on the subject, for instance in the case

of plague, seemed to suggest that probably it was not possible to explain an epidemic simply in terms of *materies morbi*. The point was whether it might be possible to account for the asymmetry of the epidemic by considering it in the way that Sir Ronald Ross had done: not merely—if it were due immediately to an organism microscopic or ultra-microscopic—concentrating upon that as was so usual, but also considering the law of the variation of the mediate carriers. In the diseases which interested the Section, where caution was needed, was to distinguish between the sudden outburst of a disease which, in the intervals, did not seem to be in existence, and the sudden acquirement of virulence of that disease. For instance, the example which seemed to be of great interest was that of scarlet fever, in which the statistics, poor though they had been in the past, were still sufficient to place it beyond doubt that there had been periods of great variation in virulence. There was an extremely virulent period at the beginning of the nineteenth century, which lasted for a time, and then there was a period of low virulence. There was another great outburst in the thirties. But, so far as he could judge—and he believed that view was shared by the President—there was, even now, very little knowledge as to the actual prevalence of scarlet fever, although there was a fairly accurate knowledge of the number of deaths. The question was whether, in the present quiescent period of scarlet fever, it might not be that the virulence of the disease was very low and not the prevalence; whereas in measles, he thought, in the quiescent intervals the prevalence of the disease was low. In other words, in forming a pathometric theory of the diseases with which the Section was concerned, it was necessary to consider not merely the existence of unknown factors, but the exact interplay of factors. That made the method which Sir Ronald Ross introduced of particular importance, because, as Sir Ronald had said, one could not form an accurate epidemiological diagnosis as to the extent of disease until an attempt had been made to express the different acting possibilities in some quantitative form. Not that the quantitative results would necessarily then be accurate, but they would form a basis for accurate thinking about the matter. Until that had been done, he thought it might be premature to alter, for example, such views as Dr. Millard had expressed in the case of small-pox. It might be a mistake to draw important inferences from the fact that in a given locality a disease had been quiescent for a large number of years.

Sir RONALD Ross, in reply, said the death-rate of 17 per mille in Cyprus was not thought to be fair, because it probably did not include all babies. The general health was not bad, and 21 per cent. for an average spleen-rate was not high. But it was not like the Tropics, and tracts of it were quite free from malaria; the disease lay only in pockets throughout the place. Nobody proposed to extend anti-mosquito measures throughout the world: only where people in any numbers were living; where it would pay. That was the first law of malaria prevention. Outside those areas one relied on

quinine, mosquito-nets, &c. He had listened with great interest to Mr. Greenwood's lucid explanation about the pathometry, and he was pleased to hear the President's reference to the "flare" phenomenon. He had not time now to expound his "fourteen factors," but for some time past he had been studying Dr. Brownlee's curves, and had found another function which accorded very closely with the probability curve which Dr. Brownlee selected for the epidemics. The fourteen factors included the frequency of biting, the effect of temperature, emigration and immigration, both of mosquitoes and of man, the number of mosquitoes and the resistance of mosquitoes and of man. He had expected Cyprus to be more developed after thirty-five years' of British rule than he found it.

Section of Epidemiology and State Medicine.

March 27, 1914.

Dr. W. H. HAMER, President of the Section, in the Chair.

On Changes in the Recorded Mortality from Cancer and their Possible Interpretation.

By MAJOR GREENWOOD, jun., and FRANCES WOOD.¹

THE questions considered in this paper have aroused the interest of many inquirers and are, indeed, well calculated to do so. If it could be shown that cancer is no more prevalent now than it has been at any time in the past, attempts to discern a causal relation between the progress of the disease and such changes in our habits of life as, for instance, alterations of diet or some hypothetical increase in the wear and tear of daily life, must be waste of labour. Alternatively, if there be truth in the popular view that cancer is on the increase it must be of importance to determine the limits within which such increment may be presumed to lie.

Writers of repute have arrived at contradictory conclusions respecting the matter, and the task we set ourselves was an examination of such statistical evidence as has been adduced on both sides of the controversy and an attempt to pursue further inquiries which might be suggested by the works examined. We have not been led to advocate any strikingly novel opinions, but we may hope that our remarks will serve to initiate a discussion and perhaps suggest to others fruitful lines of research. We have made no attempt to furnish a complete critical review of the literature; to do so would exceed the limits we have assigned to this essay, and an analysis of certain typical and important papers will be sufficient for our purpose.

¹ From the Statistical Laboratory of the Lister Institute of Preventive Medicine.

In various issues of the Registrar-General's Annual Reports during the eighties doubts were expressed as to how far the *recorded* increase of cancer mortality could be regarded as evidence of a real extension of the disease—e.g., in the forty-fifth and forty-sixth Annual Reports—but, so far as we know, the first writers to publish a detailed study of the matter were Mr. King and Dr. Newsholme, whose paper appeared in 1893. In the first part of that paper a comparison was instituted between the course of cancer mortality from 1860 to 1890 in England, Scotland, Ireland (males and females separated in each case) and the experience of the Scottish Widows' Fund.¹ Standardized rates were computed and curves applied by Mr. King's modification of Milne's graphic process. The characteristics of the resulting curves were as follows: The Irish males and females exhibit the lowest rates, which run approximately parallel and are not widely separated vertically. The English curves are far apart and show an increase in gradient with time, especially perhaps that of the males. The Scottish curves are similar but the vertical distance between them is much less than in the last mentioned case. The Scottish Widows' Fund curve (which we suppose refers almost entirely to male lives) corresponds in absolute height above the axis to the Scottish males, but its gradient, although positive, is decidedly less steep. The authors attributed the low rates for Ireland to poor diagnosis, the easier gradient of the Scottish Widows' Fund to a higher level of skill among the medical men attending persons of the insured class and the nearer approximation of male and female rates in Scotland as compared with England to better education of the general practitioner in the former country. In the concluding part of the paper the experience of Frankfurt-on-Main is described, a city in which cancer deaths had long been classified in accordance with the part of the body primarily affected. The sites were divided into accessible and inaccessible, rates of mortality were formed and the results compared. The authors concluded that the "one result of surpassing importance to be derived from them is that *in those parts of the body in which cancer is easily accessible and detected there has been no increase in the mortality from it between 1860 and 1889.*"

This paper was adversely criticized by W. Roger Williams, who objected to some details of the classification of sites and quoted in

¹ It must be remarked that the total number of deaths recorded in the last-mentioned experience was only 545, while the smallest number in any single septennial period of the other series was 2,501. In common with other observers we have found it necessary to be very cautious in the use of rates unless deduced from very large total numbers of observations.

rebuttal of the authors' general results certain hospital data. We agree with Newsholme and King in thinking that the comparison attempted to be made was illegitimate and are unable to accept the inferences drawn by Williams. There are, however, some points in King and Newsholme's paper which invite further examination. Much importance was attached to the contrast between the experience of the Scottish Widows' Fund and that of the general population. The numbers available in the former case were small and the method of smoothing, which involved a transfer of seven deaths from the second to the first septennium—i.e., increased the total in the latter by 16·7 per cent. of its original value—may have helped to diminish the gradient of the curve. But, apart from such questions of method, the nature of the comparison instituted seems questionable. The insured lives represented a highly select class from the economic aspect; their sole distinction could hardly reside in the fact, or supposed fact, that they received more skilled medical attendance than the general population. It is assumed that the difference between the trends of the curves is entirely accounted for by such differences in diagnostic skill, an assumption which involves the further hypothesis that the true occupational distribution of cancer must be constant from year to year. Both assumptions may be correct, neither is self-evidently true and no evidence is tendered in support of them.

We must also insist on the fact that no precise meaning has been assigned to the phrase, "improved diagnosis"; so far as we know, Dr. E. F. Bashford was the first inquirer to give it an intelligible meaning in connexion with cancer. We do not think that the progress of research has placed in the hands of the ordinary practitioner direct means of diagnosing cancer not available even so long as fifty years ago. The one method which, as the evidence collected by the workers of the Imperial Cancer Fund indicates, does increase the recorded incidence of cancer is post-mortem examination, especially when accompanied by the use of the microscope. We do not know of any evidence suggesting that general practitioners carry out such examinations more frequently even now than in the past. No changes in the sentiments of the laity have tended to make such procedures less repugnant to surviving relatives, and we imagine that the wishes of his clients must still have weight with the private practitioner. There are, of course, many reasons for thinking that progressively more deaths occur in institutions where autopsies are performed, but even now the proportion of deaths so occurring is not, except in London, very large, nor

would it affect the customers of insurance companies, the vast majority of whom are attended by private practitioners. It would seem, therefore, that the contrast between the experience of the Scottish Widows' Fund and that of the general population is not very conclusive evidence that improved diagnosis accounts for the recorded increase of cancer mortality. There is also some inconsistency in attaching importance to the approximation of male and female rates in Scotland as evidence of good diagnosis in that country, when the approximation, which is still closer in Ireland, is not allowed to mitigate the sentence of inferiority pronounced upon its medical condition.

Turning to the Frankfurt data, we do not very well see how the figures published really support the conclusions stated to be drawn from them. Certainly the male rates for accessible sites are irregular, and being derived from small absolute numbers do not provide a basis for any deduction; but the inaccessible rates are also irregular, although based upon larger numbers. The figures for women are puzzling; the inaccessible rates show a fairly regular increase, but so do the rates for accessible sites. If we compare the last figure with the first, in the "inaccessible" group, the 1888-89 rate is about 146 per cent. of the 1860-66 rate, and the corresponding "accessible" figure is 123 per cent., but the regularity of change in the latter instance is marred by a sudden drop in 1881-87 followed by a large increase in 1888-89. Perhaps this is due to paucity of numbers, but it can hardly be contended that there is *no* evidence of increase.

Some results detailed below support King and Newsholme's assertion that males and females suffer equally from inaccessible cancer, but the numbers quoted on p. 227 of their paper are not very good evidence. They seem to have been obtained by averaging the rates set out in Table XVI, p. 242, and little importance can be attached to simple averages derived from so short and irregular a series, even were each rate calculated from an equal number of years, which was not the case (the fifth entry is deduced from the experience of one year, the others from quinquennia). King and Newsholme's paper marked an epoch in the statistical study of the problem; it indicated an important source of fallacy and suggested ways of appreciating the magnitude of the error involved, but the conclusions summarized in it were not, we think, entirely borne out by the evidence tendered.

In the years following the publication of King and Newsholme's paper authors were generally disposed to pursue the lines of inquiry suggested by their work. Thus, in 1902, de Bovis, from a study of

the cancer rates of Frankfurt, Vienna, Hamburg, Berlin, Christiania and Switzerland, thought that the change in cancer death-rates was due to an increased mortality from visceral cancer, and he drew attention to the decrease of deaths from unknown causes reported in Switzerland coincidently with a rise in the cancer rate. In 1903 Robertson pointed out the importance of correcting for institutional deaths, a frequent cause of error, although he does not seem to have applied age-corrections to his data. Templeman's study of the Dundee statistics also showed a greater relative increase of the inaccessible sites, but the data (Dundee, 1877-1901) were not very numerous. This author held that, in spite of the facts mentioned, there had been some real increase of cancer. Another paper bearing on the question of diagnosis was that of Heimann who, on the strength of international comparisons, argued that the increase of cancer had been relatively smallest in those countries in which death certification is presumably most accurate. In 1904, Dr. Lazarus Barlow and Dr. Taylor published an elaborate paper on the experience of the Middlesex and St. George's Hospitals. From the recorded ages of hospital patients "populations" were formed of persons who attained the age of 35 in different years, and had either died in hospital or were at the time of record suffering from definitely mortal diseases—e.g., thoracic or abdominal aneurysm. The causes of death were classified as "cancer" or "not cancer," and the percentage of the total borne by the former group in each year's "population" was computed. Since such "populations" could not be complete for the more recent years, the figures for the latter were corrected on the assumption that the proportional distribution obtaining in 1895, 1896 and 1897 would apply in future populations. The results showed an increase in the proportional cancer mortality of both sexes up to 1870; after that time the percentage mortality of women remained stationary, while that of men continued to increase. Somewhat similar results were yielded by both the hospitals studied, and the authors held that the real incidence of cancer must have increased. This judgment was more recently emphasized by one of the authors, Dr. Lazarus Barlow, who in a retrospect appearing in vol. xxiii of the *Archives of the Middlesex Hospital*, writes: "The experience of the Middlesex Hospital was that cancer has been increasing steadily since the beginning of the nineteenth century in males, and was still increasing, but that in females it increased up to about the year 1874, and since that time has maintained its high level unaltered." The authors enumerated various sources of fallacy to which their method might

be subject, but we shall only deal with one which is, we think, of special importance. A possible interpretation of their results would be that, while the true incidence of cancer was constant, the relative hospital mortality had increased owing to (1) a greater proportion of admissions from cancer, (2) a lower mortality from causes other than cancer, or (3) *a different selection of hospital cases*. The first objection they hold to be met by the fact that the ratio of cancer cases to all admissions has not increased sensibly during the period 1870-99 (the figures do, however, as the authors pointed out, show some tendency to increase); they also argue that the mortality from causes other than cancer in persons aged over 35 has not diminished greatly, so that the increasing ratio could not be explained in this way. Neither of these contentions meets the difficulty italicized. It is certain that a hospital population is not a random sample of the general population, but both pathologically and economically select. If we first suppose that the basis of this selection has not been changed, that all who present themselves for admission are, so far as space permits, admitted and are of the same economic class, the increased relative death-rate from cancer would only be evidence that cancer is more fatal among persons of the class furnishing hospital patients, and only then if the death-rate from other causes *in that class* has been constant. We think, as a matter of fact, that neither the economic class nor the general fatality rate observed among hospital patients can be assumed to have remained constant, although in the case of certain occupations and diseases Greenwood and Candy failed to demonstrate any very striking change during the last fifty years (they found that the pneumonia fatality rate had not markedly diminished since 1854, and that the proportion of labourers among the hospital patients diminished between 1783 and 1907, but that there were difficulties in accepting the comparison as valid owing to possible differences of classification).

Another difficulty is this: if the policy of the hospital has not changed and the same class of patients presents itself as formerly, we should expect to find a larger proportion of *admissions* for cancer if the incidence of that disease upon the class furnishing hospital patients has increased; but the percentage admissions for cancer to the Middlesex Hospital has remained (very approximately) constant, and therefore, as it seems to us, if cancer has increased among the population the policy of the hospital or, what comes to the same thing, the policy of those who resort to the hospital cannot have remained

constant, although we can apply no direct test to either of these conclusions.

For these reasons it does not appear to us that Dr. Lazarus Barlow and Dr. Taylor's work, interesting as it is in other respects, really illuminates the problem with which we are here concerned.

In 1907, F. Prinzing published an essay in which he pointed out that in different districts with varying total cancer rates, a high rate seemed to depend upon cancer of the stomach and œsophagus, the rates for other organs remaining fairly constant. In his treatise on medical statistics published in the same year, this author points out certain pitfalls, but nevertheless remarks: "Aus den genannten Gründen darf man diese Ziffern nicht als einwandfreien Beweis der Zunahme der Krebssterblichkeit betrachten; trotzdem werden wir sie heute nicht mehr bezweifeln können" (op. cit., p. 400). We cannot, however, say that Prinzing's article contains any justification of the confidence expressed in the latter part of the quotation.

In a paper in *Public Health*, 1910-11, Clements argued that the increased recorded rate could not be entirely due to improved diagnosis because: (1) The final stages of the disease present a definite clinical picture; (2) more frequent microscopic examination would result in increasing the number of benign and reducing that of malignant tumours; (3) taking occupational groups, the higher the social status the lower the cancer-rate, although better medical skill would be available; (4) medical practitioners are not now in a better position to diagnose cancer than they were thirty years ago. Of these statements, (1) is too sweeping and (2) is not in accordance with the results published by Bashford and Murray. As to (3), some results obtained in the statistical laboratory of the Lister Institute by Brown and Lal suggest that there is no positive and perhaps even a negative correlation between occupational status and cancer mortality, but whether we can really assert that diagnosis is more accurate among the wealthier classes is doubtful in the case of large cities, where the poor resort to hospitals in considerable numbers. We have already expressed our opinion that (4) is a true statement. Among other recent authors who support the view that cancer has increased in frequency are Sanes and Parkes. The former based his conclusions upon a study of the proportions of cancers of the skin and cancers of the breast among all forms, the data being derived from the registration area of the United States, for the years 1900-07; the latter dealt with some of the English statistics, to which we shall have to refer below. With regard to Sanes's work we

think that his data were not sufficiently detailed to be of first-rate importance, quite apart from the general criticisms of the American cancer statistics, which have recently been put forth by Bashford.

In the Seventy-fourth Annual Report of the Registrar-General, Dr. Stevenson makes an important contribution to the literature of our subject. He first points out that the corrected or, to give it its new name, the standardized cancer rate of males is much higher in London than in any of the other administrative groups reviewed; the rate of female mortality is not, however, excessive. He suggests that this difference may be explained on the supposition that cancer is more easily diagnosed in females than in males, and that the London statistics more nearly represent the true incidence of the disease than do other data. There are two reasons for this belief: (1) A considerably higher percentage of cancer deaths in London is returned from institutions, in some of which post-mortem examinations are regularly performed, than elsewhere; (2) the accuracy of certification, the criterion being the proportional frequency of deaths assigned to indefinite causes, is greatest in London. Dr. Stevenson also points out that the male rate has been steadily overtaking the female rate in London: in 1891-95 the former was only two-thirds of the latter, now they are equal. In the same way he thinks it might be possible to explain the peculiar history of the increase, paying attention to age and sex. Thus, while the records show a continuous advance in all age-groups among males, change was arrested at ages 35 to 45 among females some twenty years ago, and ceased in the group 45 to 55 later. The suggestion is that we might explain the former result by supposing that there is still, taking the country as a whole, room for improvement in diagnosis at every age in males; while the cessation of increase in the rate among middle-aged women may mean that cancer being better diagnosed at the earlier ages is now seldom overlooked, although it was so formerly. Dr. Stevenson thinks that a table showing the rates at ages 45 to 65, and at 65 and over, in different districts, generally supports this contention, although he notes that the rates for extra-metropolitan areas when compared among themselves do not seem quite favourable to it. We must also refer to a comparison between the distributions of deaths classified by sites as reported from different classes of institution and from private practice. This does not bear upon the main problem, but is indirectly of much importance, since it shows that the type of the institutional cancer "population" differs from that of the non-hospital class, a result which strengthens our belief that hospital statistics

must be interpreted with caution by students of the problem under discussion.

A review of the whole of the evidence, which we have of course been obliged to summarize imperfectly, leads Dr. Stevenson to doubt whether the real incidence of cancer in England and Wales has increased, and the hypothesis he puts forward is enunciated in the following question: "Whether England and Wales in 1911 do not compare with England and Wales in 1881 more or less as London in 1911 does with rural districts in 1911?"¹ That is to say, the change is the product of continuously improving diagnosis—the capital leads the way, and the provinces now occupy ground formerly occupied by London. It seems to us that Dr. Stevenson's report is the most valuable contribution to the statistical branch of the subject which has yet appeared. Not only is it based upon a considerable body of evidence, but it gives the hypothesis used by the earlier writers, such as King and Newsholme, a more intelligible form. We know that post-mortem investigation is an important means of assuring accuracy of diagnosis, and we know that such inquiries are more frequently carried out in London; we also know that the improved pathological equipment of the London schools both by precept and example reacts upon the provinces. The mind can therefore readily conceive how the change premised by Dr. Stevenson might have been brought about, and his inquiry forms a fitting starting point for further investigation. We shall describe our own results lower down, here we confine ourselves to a few reflections prompted by his own remarks.

In the first place, as he observes, the order of the other districts, apart from London, is irregular. Thus, taking males 45 to 65, in Wales the county boroughs have the lowest rate, other urban districts and rural districts being practically equal. Again the Midland county boroughs have the lowest rate for males over 65. In the north the county boroughs have a lower rate than other urban districts. Among females the orders are very irregular, a statement which is still true when the capital is included.

In the second place, the question of female mortality needs further consideration. If we classify the 20,313 deaths from cancer among females in 1911, according to the scheme given on p. 18 of the second

¹ The wording of this paragraph has tended to convey the impression that this question represents a settled opinion. We desire explicitly to state that we understand Dr. Stevenson's question to be a purely hypothetical one, and not to convey any definite conclusion.—
M. G., F. W.

report of the Imperial Cancer Research Fund, into accessible, inaccessible and intermediate sites, we find that 41 per cent. were accessible, 48·2 per cent. inaccessible, 6·5 per cent. intermediate, and 4·3 per cent. could not be classified. If we assume that improvements in diagnosis would principally affect the inaccessible group, there is a large field for the operation of this cause in the case of women. But the London figures do not, in fact, show a generally higher rate than other districts. This really understates the difficulty, and for the following reason. The statistics of Table I of Bashford and Murray's report already cited, admittedly based upon small numbers however, show that post-mortem examinations are likely to produce considerable additions to the numbers of recorded cancers of the uterus. Thus, if we have correctly interpreted the table, out of forty-two cases of carcinoma eleven were only recognized post mortem or after operation. Confining ourselves to post-mortem cases, out of forty, nine (23 per cent.) were added by such examination. Now compare this with the statistics of a typically inaccessible site, the stomach. In 173 records thirty-nine (23 per cent.) were due to the autopsy; the proportional additions were the same in the two cases. It is difficult to understand why London does not exhibit a less marked but still substantial superiority over the provinces in the case of females also.

A third point is that Dr. Stevenson's argument seems to assume that the diagnosis of cancer in women between 35 and 45 ceased to improve as long as twenty years ago. There is evidence in favour of this—viz., the observation that the proportion of accessible cancers is higher at the earlier ages, but we know of nothing else save the fact that the cancer rate *has* been steady at this age, which can be said to support the hypothesis, and the last-mentioned fact is, of course, not inconsistent with other views.

Let us now endeavour to test the hypothesis that the recorded changes are merely the reflections of improving diagnosis. It seemed to us that a comparison of changes in the rates of different parts of the country during a series of years might be helpful for the following reasons. If we compare London with (a) a mainly rural county or counties, (b) with an urban county, we should have to consider the following possibilities: (I) If at the beginning of the series of years the conditions for establishing a diagnosis of cancer were already on a much higher level in London than elsewhere, then throughout the series the other districts would tend to increase their rates faster than London *if* a steady general improvement in medical knowledge, or facilities for

effecting a diagnosis, were taking place. (2) If London not only started in a better position, but continued to improve at a faster rate, then the London annual curve should be the steeper. (3) If the course of events be quite different in different areas—e.g., the rates of change being variable—the gradients of the annual curves may bear any relation one to another. Such a comparison will, therefore, *not* provide us with a general solution, but it will throw light upon the simple and intelligible form of the hypothesis advanced by Dr. Stevenson. The point here raised seems to us one of great interest, and we may be permitted to explain it somewhat more fully.

Let us suppose that the incidence of some disease upon a community is strictly constant, that the same proportion of deaths from it really exists in each year, and that at the beginning of our observations no means of diagnosing it are available, so that no deaths are recorded. Now let us imagine that imperfect means of diagnosing the disease are introduced, and that they improve from year to year; the effect upon the curve of recorded rates will depend upon the way in which the improvements are effected. If, for instance, an infallible method be suddenly discovered and disseminated, the rate will shoot upwards, and then run parallel with the abscissa at a height corresponding or nearly corresponding to the real incidence. If smaller improvements be introduced at discontinuous intervals, the curve will exhibit a series of step-like ascensions until, as before, a constant level is ultimately reached. If the intervals be very short, the steps will be smoothed out and the constant level smoothly approached; in the most probable case the curve never becoming absolutely parallel with the base, but having for asymptote a straight line parallel to the axis of X (the abscissa), and intersecting the ordinate axis at a height measuring the true incidence. Given such a state of affairs, let us finally suppose that two fragments of the curve of rates are available for our inspection; a portion derived from the period when diagnosis was still very imperfect, and a portion from the later years of the experience when diagnosis had been further improved; let us say two periods of ten years in series, the last year of the first series being several years earlier than the first year of the second series. Had some revolutionary change come into operation in the course of one series or in the interval between the two, very startling differences might appear; thus, one of the curves might exhibit a sudden change of gradient, or, alternatively, the first might be ascending and the second be almost horizontal. But in the more probable case of small continuous improvements we should not expect any such dramatic result.

It would be likely that the two portions would not be long enough to give us reason to suppose that either was a "curve," in the popular sense, at all. On the contrary, it would be more probable that each would, paying attention to chance fluctuations, seem to be as closely represented by a straight line as by any other locus. Indeed, in the case of such a perfectly continuous non-linear function as the logarithm of a number, we know that for short ranges a straight line very well represents the changes of the logarithm as the number is increased by constant amounts (a fact which justifies our customary method of interpolating between tabular values of logarithms). But if the portions are taken from different parts of the curve, the representative straight lines will not have the same gradient; the nearer we are to perfection the less will be the slope. We illustrate the point in Diagram I, which

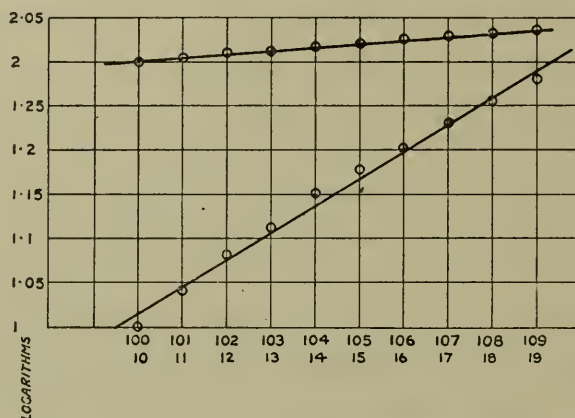


DIAGRAM I.

The upper range of points represents the logarithms of 100—109. Fitted with a straight line. The lower range is a similar representation of logarithms 10—19.

portrays the line representing logs. 10 to 19 and that corresponding to logs. 100 to 109. Two conclusions emerge: the first, that in any short series of years we are not likely to detect the form of a curve which will ultimately run parallel with the abscissa; the second, that we should expect, assuming the hypothesis just described to be well founded, that straight lines would fairly represent such small portions, and that they would exhibit differences of gradient. Consequently, if we could regard different communities within a nation as being samples of the ideal curve at different parts of its journey, from the zero of complete non-recognition of the disease to the maximum of complete diagnosis, we should detect differences in gradient. This is the rationale of the method we devised to test Dr. Stevenson's form of

the hypothesis as applied to cancer, and although our particular application is subject to numerous imperfections, partly inherent in the data and partly the consequence of our being obliged to write this paper in a rather limited time, we believe the method to be serviceable in other cases.

TABLE IA.—CRUDE DEATH-RATE FROM CANCER PER 1,000,000 LIVING FOR THREE URBAN AND THREE RURAL REGISTRATION COUNTIES, 1881-1900. PERSONS.

Year	URBAN COUNTIES						RURAL COUNTIES					
	London		Lancashire		Northumberland		Lincolnshire		Somersetshire		Wiltshire	
	Death-rates	Index Nos.*	Death-rates	Index Nos.*	Death-rates	Index Nos.*	Death-rates	Index Nos.*	Death-rates	Index Nos.*	Death-rates	Index Nos.*
1881	610	80	410	74	570	88	630	84	580	76	520	73
1882	630	82	410	74	520	80	610	81	610	80	630	89
1883	650	85	420	76	500	77	580	77	670	88	530	75
1884	650	85	430	78	470	73	590	78	660	86	590	83
1885	640	84	440	79	510	80	600	80	590	77	660	93
1886	648	85	457	83	580	90	603	80	703	92	598	84
1887	690	90	485	88	591	91	683	91	682	89	549	77
1888	683	89	512	92	626	97	652	87	752	99	652	92
1889	696	91	523	94	634	98	743	99	752	99	678	96
1890	786	103	555	100	660	102	767	102	769	101	801	113
1891	792	104	572	103	677	105	803	107	766	100	736	104
1892	759	99	582	105	694	107	745	99	771	101	717	101
1893	804	105	590	107	715	111	857	114	778	102	725	102
1894	810	106	595	107	685	106	816	108	795	104	895	126
1895	846	111	631	114	686	106	874	116	831	109	757	107
1896	870	114	647	117	733	113	903	120	832	109	792	112
1897	888	116	677	122	756	117	899	119	889	116	835	118
1898	918	120	703	127	754	117	837	111	887	116	726	102
1899	944	124	704	127	752	116	939	125	984	129	844	119
1900	964	126	730	132	812	126	933	124	962	126	938	132
Gradient of the best fitting straight line †	2.449		3.219		2.420		2.687		2.423		2.486	

* The mean of the whole series has been taken as a base.

† The straight lines have been fitted to the index numbers and not to the actual death-rates, in order that the gradients may be comparable one with another.

We decided to use London, the assumed high-water mark of diagnostic skill; Lancashire, a highly urbanized county; Northumberland, a partly urbanized county; and Wiltshire, Lincolnshire, and Somersetshire as instances of more or less rural areas. The periods 1881-1901 and 1901-11 are separately considered; in the former series we deal with persons, in the latter the sexes are taken separately. We begin with the 1881-1901 data. Diagram IIA shows the best fitting straight lines

applied (by the method of least squares) to index numbers formed by taking the mean rate of each series as 100, and Table IA contains the data and gradients of the fitted lines. These constants and

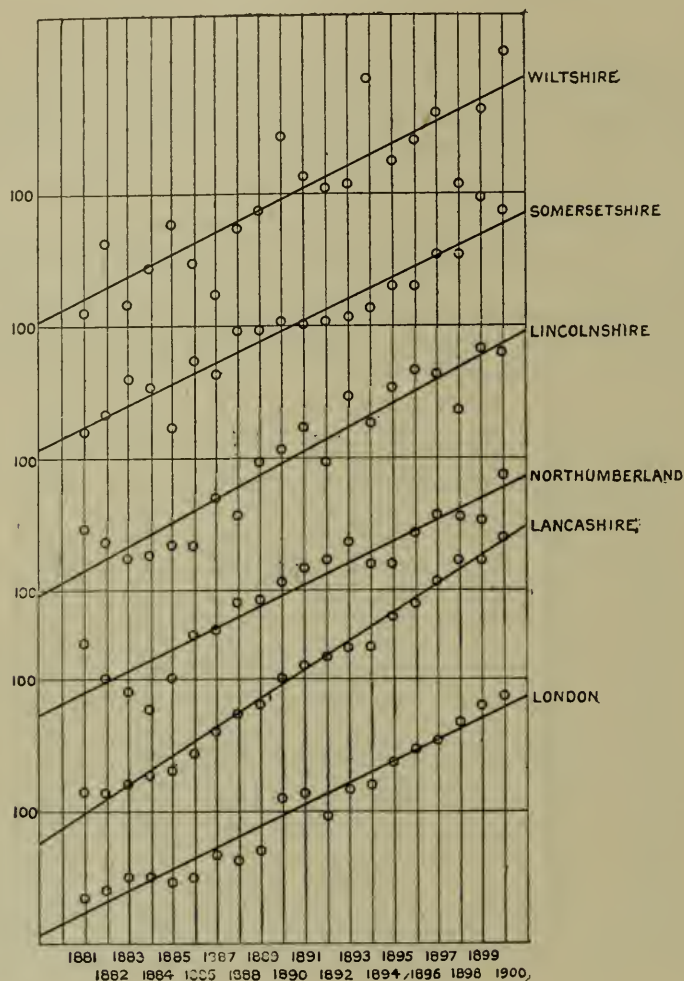


DIAGRAM IIA.

Index numbers showing the changes in the crude death-rates from cancer for three urban and three rural registration counties with the best fitting straight lines,* 1881-1900. Persons.

* The tangents of the angles made by straight lines drawn upon this diagram with the abscissæ are not equal to the values given in the last line of Table I. This is because an arbitrary unit has been chosen in order to make a convenient diagram. Since the same unit has been used throughout the lines are perfectly comparable one with another. This applies to the diagrams throughout the paper, but in every case the unit chosen has been the same—viz., the base unit is five times as large as the vertical unit.

diagrams refer to index numbers computed from the crude rates. We next allowed for changes in age constitution by the following method, which, although not free from objection on theoretical grounds, has

the advantage of simplicity. The population of England and Wales in 1901 was taken as the standard population and the mean cancer rates at ages for 1901-11 as the standard rates. Age and sex correction factors were then computed for each county population (excepting Wiltshire, the results from which in the case of crude rates seemed to argue that the population at risk was too small to afford reliable indications) as shown at the censuses of 1881, 1891 and 1901. Correction factors for the intercensal years were prepared by adding to the factor

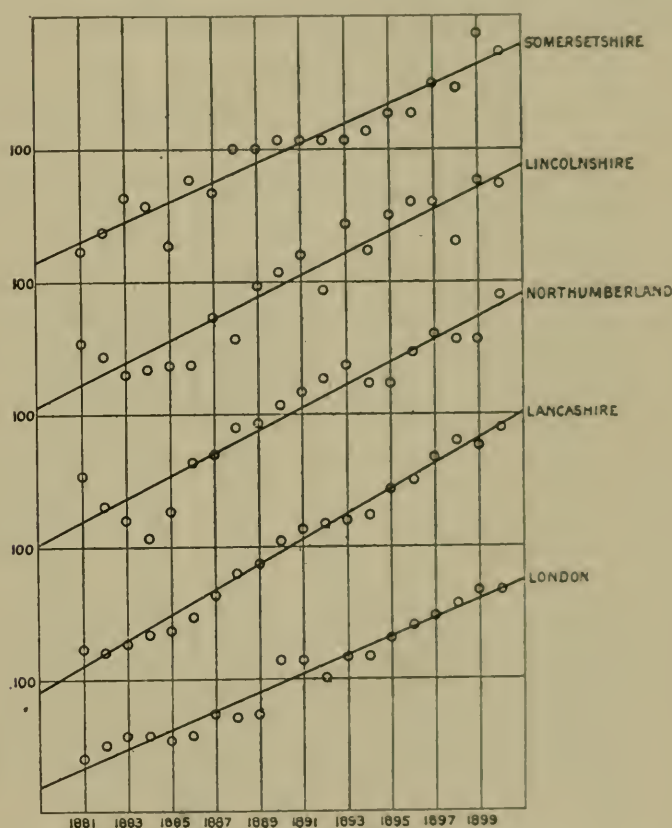


DIAGRAM IIB.

Index numbers showing the changes in the corrected death-rates from cancer for three urban and two rural registration counties with the best-fitting straight lines,* 1881-1900. Persons.

* See footnote to Diagram I.

for the first census one-tenth of the difference between that factor and the next in series multiplied by the difference in years between the first and the second census. For instance, the correction factor used for 1884 was the 1881 factor plus three-tenths of the difference between the 1881 and 1891 factors. The rates thus corrected were again expressed as index numbers and straight lines fitted (Diagram IIB and Table Ib).

The actual gradients are of course different in the two cases, but the relative positions of the counties are not so much affected as might have been surmised; nevertheless, as there are certain alterations, we shall confine our remarks to the age-corrected figures. At first sight it would appear that the gradients justify Dr. Stevenson's suggestion: we should anticipate that the London gradient would be the least, and so in fact

TABLE IB.—CORRECTED DEATH-RATE FROM CANCER PER 1,000,000 LIVING FOR THREE URBAN AND TWO RURAL REGISTRATION COUNTIES,* 1881-1900. PERSONS.

Year	URBAN COUNTIES						RURAL COUNTIES			
	London		Lancashire		Northumberland		Lincolnshire		Somersetshire	
	Death-rates	Index Nos.†	Death-rates	Index Nos.†	Death-rates	Index Nos.†	Death-rates	Index Nos.†	Death-rates	Index Nos.†
1881	689	82	507	77	624	86	551	86	479	77
1882	710	85	505	76	571	79	531	83	504	81
1883	731	87	516	78	550	76	503	79	554	89
1884	729	87	527	80	519	72	510	80	546	87
1885	716	86	538	81	564	78	517	81	488	78
1886	723	87	558	84	643	89	518	81	582	93
1887	768	92	590	89	657	91	584	92	565	90
1888	758	91	622	94	698	97	556	87	623	100
1889	771	92	634	96	708	98	631	99	623	100
1890	868	104	671	101	739	102	649	102	638	102
1891	873	104	689	104	760	105	677	106	636	102
1892	832	100	698	105	779	108	627	98	637	102
1893	878	105	705	106	803	111	720	113	640	102
1894	880	105	707	107	770	107	685	107	651	104
1895	915	109	746	113	771	107	732	115	677	108
1896	936	112	762	115	824	114	755	118	674	108
1897	951	114	793	120	850	118	751	118	717	115
1898	978	117	820	124	848	117	698	109	712	114
1899	1001	120	817	123	846	117	782	123	786	126
1900	1007	120	843	127	914	127	776	122	765	122
Gradient of the best fitting straight line ‡	2.095		2.865		2.565		2.449		2.209	

* The crude death-rates for Wiltshire were so irregular, owing to the small size of the population upon which they were based, that corrected rates were not calculated for this County.

† See footnote (*) to Table IA.

‡ See footnote (†) to Table IA.

it is; but further examination reveals difficulties. The two rural counties have the next smallest gradients to London, Somerset not being very different from the metropolis, while the highly urbanized county of Lancashire has the steepest gradient in the series. It is difficult to suppose that Somerset and Lincoln represent a later phase

in the developing accuracy of diagnosis and certification than do Lancashire and Northumberland, and we must conclude that, if the principle of the method be accepted, the results are unfavourable to the simple hypothesis.

TABLE IIA.—CRUDE DEATH-RATE FROM CANCER PER 1,000,000 LIVING FOR THREE URBAN AND TWO* RURAL REGISTRATION COUNTIES, 1901-1910, MALES AND FEMALES.

Year	URBAN COUNTIES						RURAL COUNTIES			
	London		Lancashire		Northumberland		Lincolnshire		Somersetshire	
	Death-rates†	Index Nos.‡	Death-rates	Index Nos.‡	Death-rates	Index Nos.‡	Death-rates	Index Nos.‡	Death-rates	Index Nos.‡
<i>Males—</i>										
1901	798	82	593	88	734	97	762	88	785	92
1902	905	93	605	90	689	91	700	81	720	85
1903	936	96	629	94	690	92	815	95	834	98
1904	931	95	618	92	765	102	889	103	788	93
1905	910	95	688	102	717	95	927	108	861	101
1906	1028	105	687	102	741	98	918	107	740	87
1907	1022	105	666	99	721	96	932	108	874	103
1908	1055	108	713	106	777	102	896	104	1055	124
1909	1059	109	716	107	816	108	956	111	996	117
1910	1096	112	801	119	883	117	817	95	859	101
Gradient of the best fitting straight line§	2.897		2.903		2.055		2.012		2.733	
<i>Females—</i>										
1901	1066	94	905	98	964	104	984	86	1105	99
1902	1109	97	893	97	922	99	1061	93	1082	97
1903	1133	100	921	100	933	100	1140	100	991	89
1904	1122	99	879	95	872	94	1270	111	1170	105
1905	1128	99	892	97	938	100	1017	89	1063	95
1906	1170	103	941	102	942	101	1138	99	976	87
1907	1133	100	944	102	834	90	1168	102	1172	105
1908	1165	102	914	99	1008	108	1237	108	1137	102
1909	1196	105	975	106	940	101	1213	106	1189	106
1910	1158	102	976	106	961	103	1219	106	1305	117
Gradient of the best fitting straight line§	0.879		0.945		0.206		1.661		1.709	

* The County of Wiltshire has been omitted. When the two sexes were separated the yearly death-rates became very irregular owing to their being based upon a relatively small number of deaths.

† These death-rates differ slightly from those given in the Registrar-General's Annual Reports, as they have been recalculated, using more correct populations for the different years. The original figures were calculated assuming that the population of London between 1901 and 1911 had increased at the same rate as during the previous decennium, whereas, as matter of fact, there had been an actual decrease of about 15,000 persons.

‡ See footnote (*) to Table IA.

§ See footnote (†) to Table IA.

Passing to the years 1901-10, for which the separate returns for males and females are available, Tables IIA and IIB contain the statistical results prepared in the same way as before. Again confining our attention to the age-corrected figures, we undoubtedly find a somewhat different state of affairs, since now there is a general distinction

TABLE IIB.—CORRECTED DEATH-RATE FROM CANCER PER 1,000,000 LIVING FOR THREE URBAN AND TWO RURAL REGISTRATION COUNTIES, 1901-1910. MALES AND FEMALES.

Year	URBAN COUNTIES						RURAL COUNTIES			
	London		Lancashire		Northumberland		Lincoln		Somerset	
	Death-rates*	Index Nos.†	Corrected death-rates	Index Nos.†	Corrected death-rates	Index Nos.†	Corrected death-rates	Index Nos.†	Corrected death-rates	Index Nos.†
<i>Males—</i>										
1901	864	87	699	93	806	101	602	89	615	95
1902	968	97	706	94	752	94	552	82	652	87
1903	989	99	725	97	747	93	642	95	647	100
1904	971	98	704	94	822	103	700	103	608	94
1905	958	96	774	103	764	96	729	108	660	102
1906	1045	105	763	102	783	98	721	107	564	87
1907	1026	103	731	98	756	95	731	108	663	102
1908	1046	105	773	103	809	101	702	104	796	122
1909	1036	104	767	102	843	106	749	110	748	114
1910	1058	106	847	113	905	113	639	94	641	98
Gradient of the best fitting straight line ‡	+1·661		+1·679		+1·273		+1·818		+2·030	
<i>Females—</i>	*									
1901	1092	98	1027	103	1098	106	838	87	875	102
1902	1125	101	1003	101	1044	101	901	94	850	99
1903	1139	102	1023	103	1050	102	964	101	773	90
1904	1117	100	965	97	975	94	1070	112	905	106
1905	1112	100	969	97	1043	101	854	89	816	95
1906	1143	102	1010	101	1041	101	952	99	744	87
1907	1096	98	1002	101	916	89	974	102	886	104
1908	1116	100	959	96	1100	107	1028	107	853	100
1909	1134	102	1011	101	1019	99	1004	105	884	103
1910	1087	97	1000	100	1036	100	1006	105	963	113
Gradient of the best fitting straight line ‡	-0·097§		-0·279§		-0·352§		+1·576		+0·921	

* These rates have been obtained by correcting the rates for London given in Table IIA, and not the rates given by the Registrar General in his Annual Reports.

† See footnote (*) to Table IA.

‡ See footnote (†) to Table IA.

§ The negative sign indicates that the death-rate has been decreasing.

between the urban counties on the one hand and the rural on the other. For males, all the urban lines show a less steep gradient than do the rural ones, precisely as we should anticipate on the simple hypothesis, and there is a similar distinction in the case of females. Were these the only results before us, we should conclude that Dr. Stevenson's

TABLE III.—CORRECTED DEATH-RATE * PER 1,000,000 PERSONS LIVING OVER 35 YEARS OF AGE FROM CANCER IN AGGREGATES OF URBAN AND RURAL COUNTIES, 1901-1910. MALES AND FEMALES.

Year	MALES				FEMALES			
	Urban Counties		Rural Counties		Urban Counties		Rural Counties	
	Death-rates	Index Nos. †	Death-rates	Index Nos. †	Death-rates	Index Nos. †	Death-rates	Index Nos. †
1901	2218	89	2006	91	2993	96	2681	95
1902	2254	90	1957	89	3030	97	2757	97
1903	2357	95	2064	94	3101	99	2685	95
1904	2371	95	2092	95	3033	97	2831	100
1905	2434	98	2189	100	3068	98	2739	97
1906	2592	104	2193	100	3166	101	2789	98
1907	2518	101	2244	102	3143	101	2897	102
1908	2644	106	2303	105	3143	101	2856	101
1909	2656	107	2665	121	3258	104	3105	109
1910	2865	115	2285	104	3273	105	3022	107
† Gradient of the best fitting straight line	2.596		2.513		0.923		1.412	

* These rates were taken from the Registrar-General's Annual Reports. Up to 1908 the death-rates per 1,000,000 of persons over 35 years of age were given; but after that date for all ages. In the Report for 1908, however, the average corrected rate for *all ages* for the period 1903-07 is given, and can be compared with the corrected rate for the same period for *ages over 35 only*. Hence the value of the ratio

$$\frac{\text{Death-rate over 35 from cancer, 1903-07}}{\text{Death-rate at all ages from cancer, 1903-07}}$$

was obtained, and the death-rates for years after 1907 were multiplied by this factor to make them comparable with those of the earlier years. The actual values of this ratio were: Males, Urban, 3.064, Rural, 3.067; Females, Urban, 2.946, Rural, 2.960.

† See footnote (*) to Table IA.

‡ See footnote (†) to Table II.

hypothesis ought to be accepted. In view, however, of the divergent indications afforded by the previous series, based as they were upon a longer experience, we do not feel justified in assenting to this conclusion. Even here there are certain peculiarities; London for instance no longer has the least gradient, its position in the old series is occupied

now by Northumberland, so that if we are to trust the later results we must confine ourselves to contrasting urban with rural counties, in which event the only circumstance favourable to the hypothesis in the 1881-1901 series—viz., the position of London—loses any importance it may have possessed.

Assuming that the comparison should be made between all urban and all rural districts, we ought to be able to decide between our two series by an aggregate comparison. The corrected rates for ten years

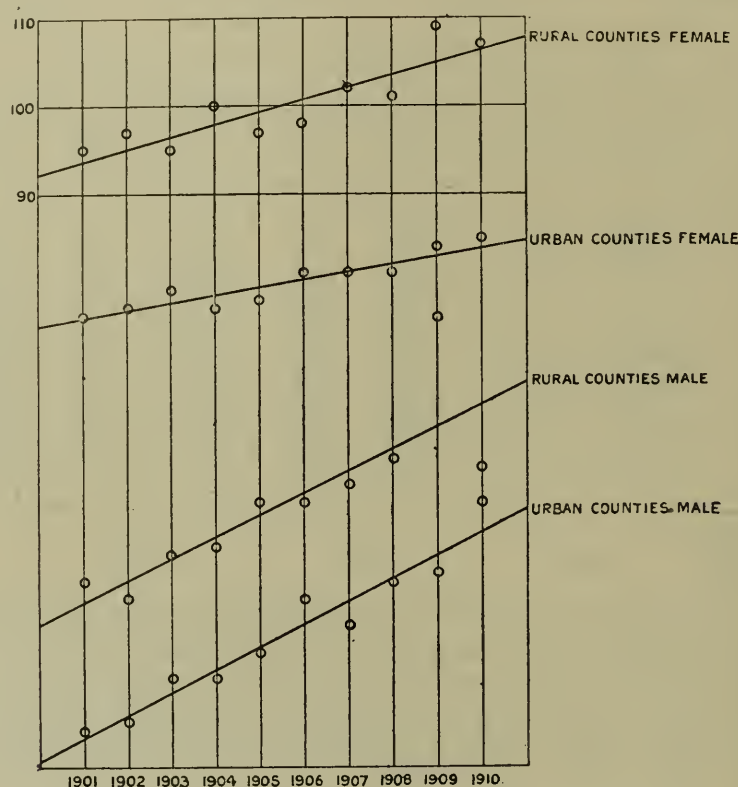


DIAGRAM III.

Index numbers showing the changes in the death-rates from cancer for urban and rural counties, with the best fitting straight lines, 1901-10. Males and females.

appear with the appropriate constants in Table III. It will be seen that the gradients of the lines for males do not differ essentially; the line for rural females has, however, ascended more steeply than that for the females in urban districts. It may perhaps be said that the results of this comparison rather confirm the 1881-1901 series, but the course of the rates is perplexing. Thus the males in rural districts show a marked decline in 1910, as compared with 1909, a phenomenon not seen in the urban districts nor among the females.

The results of another tentative inquiry are of interest here. Assuming that the proportion of deaths occurring in institutions where autopsies may be performed is some criterion of diagnostic facilities, we thought it would be well to compare changes in the proportions. The Registrar-General's Annual Reports for 1881, 1886, 1891, 1896, 1901 and 1906 were searched and the deaths occurring in hospitals, nursing

TABLE IV.—TABLE SHOWING THE NUMBER OF ADULTS DYING IN GENERAL HOSPITALS IN SIX SELECTED REGISTRATION COUNTIES,* 1881-1906.

County	Number of hospitals	Number of adults dying in general hospitals	Total number of deaths of persons aged 1 year and upwards	Percentage of hospital deaths to all deaths over 1 year	County	Number of hospitals	Number of adults dying in general hospitals	Total number of deaths of persons aged 1 year and upwards	Percentage of hospital deaths to all deaths over 1 year
<i>London—</i>					<i>Lincolnshire—</i>				
1881	50	4,991	61,698	8.1	1881	7	84	5,994	1.4
1886	60	5,528	61,227	9.0	1886	9	92	6,348	1.4
1891	72	6,529	68,346	9.6	1891	7	95	7,052	1.3
1896	66	6,671	59,225	11.3	1896	7	81	5,574	1.5
1901	72	7,389	58,546	12.6	1901	9	147	5,792	2.5
1906	75	8,358	55,746	15.0	1906	10	229	5,920	3.9
<i>Lancashire—</i>					<i>Somersetshire—</i>				
1881	30	1,360	57,037	2.4	1881	12	217	6,834	3.2
1886	37	1,787	61,855	2.9	1886	16	244	7,214	3.4
1891	44	2,463	71,078	3.5	1891	17	250	7,768	3.2
1896	47	2,396	61,469	3.9	1896	15	240	6,345	3.8
1901	50	2,912	63,520	4.6	1901	16	228	5,767	4.0
1906	57	3,465	62,492	5.5	1906	16	273	5,563	4.9
<i>Northumberland—</i>					<i>Wiltshire—</i>				
1881	4	147	6,195	2.4	1881	5	31	3,531	0.9
1886	8	227	6,748	3.4	1886	8	52	3,564	1.5
1891	7	280	8,125	3.4	1891	8	64	3,609	1.8
1896	8	345	6,893	5.0	1896	9	57	2,963	2.9
1901	10	490	8,280	5.9	1901	11	70	3,129	2.2
1906	14	539	8,293	6.5	1906	12	134	3,228	4.2

* Deaths occurring in Workhouses, Workhouse Infirmaries, Isolation Hospitals, Lying-in Hospitals, Children's Hospitals and Hospitals for Special Diseases other than cancer have not been included.

or surgical homes and infirmaries (other than workhouse infirmaries) were extracted. We excluded Poor Law infirmaries, children's hospitals and hospitals for infectious diseases. The proportion of deaths in the selected institutions to all deaths at ages over 1 was computed in the case of each county and the results appear in Table IV.

It will be seen that the proportion is far higher in London than elsewhere, but the relative increase is greater in the other districts excepting Somerset. Were we to go by this test we should certainly

infer that the means of diagnosis began on a higher level in London but improved less rapidly there than elsewhere; hence, on our original hypothesis, we should expect the London cancer gradient to be less steep than in the other districts excepting Somerset. As we have seen, this is not the case. But we are not disposed to attach very much importance to this test. One objection is that we may have failed to select the right institutions; another is that the number of institutional deaths is absolutely so small, except in the metropolis, that it can have had very little direct influence upon the local cancer death-rate. It is, of course, possible that the existence of quite a small institution providing a centre at which operations may be performed and some pathological work carried out, makes more difference to the general level of knowledge in its vicinity than could be inferred merely from the number of patients admitted to and dying within its walls, but we have no statistical evidence that this is so.

On the whole, as we have said, we seem to be justified in answering "no" to Dr. Stevenson's question—"Whether England and Wales in 1911 do not compare with England and Wales in 1881 more or less as London in 1911 does with rural districts in 1911?"

The course of the changes seems to be inconsistent with so simple an hypothesis. It must be clearly understood, as stated on p. 129 *supra*, that our method cannot disprove the general statement that the recorded increase in cancer rate is a result of improved diagnosis, since we do not know that the improvements have not followed a different law in the different types of district; but a presumption against this is created by the failure of the great urban counties uniformly to differentiate themselves from the rural counties in virtue of their rates of change. This, however, is an argument we cannot push far, for in the 1901-11 experience there is some differentiation, and the most we claim is to have made out a case against the simplest and most intelligible form of the explanation by diagnosis which has been put forward.

We now turn to a group of inquiries directed more particularly to the question of diagnosis. We first considered the ratio of deaths from old age to deaths from cancer. Assuming that the real incidence of cancer is constant and that where facilities for making a diagnosis are poor many deaths from cancer would be certified as due to old age, it seemed that a knowledge of the changes in this ratio would be of interest. Straight lines were fitted as before to the London, Somerset, Lincoln and Lancashire ratios for 1890-1910. There are no very sharp

differences, nor do such as appear fall into a regular order. London has indeed the steepest gradient, but it is closely followed by Somerset, which has a steeper line than the highly urbanized county of Lancashire (Table V).

TABLE V.—CHANGE IN THE RATIO OF DEATHS FROM OLD AGE TO DEATHS FROM CANCER FOR FOUR REGISTRATION COUNTIES. MALES. 1890-1910.

Year	URBAN COUNTIES				RURAL COUNTIES			
	London		Lancashire		Lincolnshire		Somersetshire	
	Deaths from old age	Index Nos.*	Deaths from old age	Index Nos.*	Deaths from old age	Index Nos.*	Deaths from old age	Index Nos.*
	Deaths from cancer		Deaths from cancer		Deaths from cancer		Deaths from cancer	
1890	0.777	139	1.650	144	2.197	130	2.248	135
1891	0.802	143	1.470	128	2.083	125	2.217	134
1892	0.730	130	1.441	126	2.141	127	2.396	144
1893	0.762	136	1.260	110	1.632	97	1.736	105
1894	0.535	95	1.109	97	1.671	99	1.732	104
1895	0.640	114	1.321	115	1.896	112	2.193	127
1896	0.527	94	1.200	105	1.518	90	1.474	89
1897	0.518	92	1.103	96	2.006	119	1.481	89
1898	0.530	94	1.042	91	1.775	105	1.650	99
1899	0.595	106	1.245	109	1.869	111	1.762	106
1900	0.577	103	1.197	105	1.746	104	1.695	102
1901	0.590	105	1.056	92	1.714	102	1.659	100
1902	0.496	88	1.070	93	1.708	101	1.641	99
1903	0.441	79	1.012	88	1.485	88	1.271	77
1904	0.504	90	1.097	96	1.486	88	1.630	98
1905	0.487	87	0.983	86	1.357	80	1.383	83
1906	0.469	84	1.039	91	1.607	95	1.765	106
1907	0.458	82	1.024	89	1.368	81	1.370	83
1908	0.416	74	0.953	83	1.383	82	1.116	67
1909	0.497	89	0.958	84	1.342	80	1.368	82
1910	0.433	77	0.813	71	1.436	85	1.143	69
† Gradient of the best fitting straight line	-2.858 †		-2.432 †		-2.116 †		-2.743 †	

* See footnote (*) to Table IA.

† See footnote (†) to Table IIA.

‡ The negative sign indicates that there has been a decrease in the value of the ratio.

None of the lines, however, fit the observations at all closely, which is not surprising, since weather conditions must influence the true death-rate among aged persons and such effects may well be sufficient to mask any regular transfer of certain deaths formerly attributed to senility to another group. We think the results of this particular test must be regarded as purely negative.

We now turn to the rates for different sites and begin with the experience of England and Wales, 1897-1911. The data used were read off from the diagrams on pp. lxi and lxx of the Registrar-General's Annual Report for 1910. The sites selected for analysis were, in males, intestine, tongue, rectum, stomach, liver; in females, intestine, rectum, breast, stomach, uterus and liver. Lines have been fitted to index numbers derived both from corrected and uncorrected rates, except in the instance of the liver, which we only included as a possible criterion of changes in diagnosis. Tables VIA and VIB and Diagrams IVA, IVB, VA and VB were constructed on the same principles as before. Beginning with the males (corrected figures) we notice that the stomach-rate has increased less than that of the tongue, which is represented by a line of sensibly the same gradient as the rectum; the rate of intestinal cancer has advanced faster than any of the others. Among females, we find a similar rate of increase both for the breast and the stomach, a slightly greater rate of change in the rectum and a markedly steeper gradient for the line of intestinal cancer. The slope of the uterine rates is actually negative. The position of intestinal cancer can easily be explained on the hypothesis of improved diagnosis, but the other results seem to us quite inconsistent with this supposition. Cancer of the tongue in males and of the breast in females, typically accessible sites, have increased faster than cancer of the stomach, the difference in the case of the tongue being quite appreciable. Cancer of the rectum, again, has not advanced very much, if at all, faster than that of the accessible sites. It is a point not without significance that cancer of the rectum has in both sexes increased faster than cancer of the stomach, although the former has always been presumably easier to diagnose than the latter.

The decrease in uterine cancer cannot be passed over in silence. Bashford and Murray's figures seem to suggest that diagnosis of uterine cancer is subject to as much alteration on the findings of an autopsy as malignant disease of other sites, so that with an assumed constant incidence and improved diagnosis we ought to have had an increase in cancer of this site too. Are we to suppose either (1) that diagnosis in the particular instance of cancer of the uterus has deteriorated or (2) that owing to operative improvements the true death-rate from the disease has diminished, the incidence remaining the same? We can of course discard (1), but (2) is impossible to answer. There is no doubt that more persons, at least in London, now resort to hospitals than before, and it is generally believed that both the technique and

TABLE VIA.—CRUDE DEATH-RATE PER 1,000,000 LIVING FROM CANCER OF CERTAIN SPECIFIED ORGANS OF THE BODY, 1897-1911. MALES AND FEMALES.

(A) Males.

Year	SPECIFIED ORGANS									
	Stomach		Intestine		Rectum		Liver		Tongue	
	Death-rates	Index Nos.*	Death-rates	Index Nos.*	Death-rates	Index Nos.*	Death-rates	Index Nos.*	Death-rates	Index Nos.*
1897	131	82	40	67	55	74	90	95	32	77
1898	139	87	40	67	62	84	87	92	33	80
1899	137	86	45	76	61	82	89	94	36	87
1900	138	87	47	79	61	82	95	101	37	90
1901	150	94	50	84	66	89	95	101	36	87
1902	150	94	50	84	72	97	95	101	40	97
1903	160	101	51	86	78	105	99	105	40	97
1904	165	104	55	93	77	104	96	102	38	92
1905	165	104	61	103	75	101	95	101	45	109
1906	171	107	69	116	81	109	97	103	43	104
1907	164	103	64	108	85	115	91	96	44	106
1908	169	106	70	118	85	115	95	101	47	114
1909	175	110	80	135	80	108	98	104	49	119
1910	183	115	82	138	86	116	97	103	49	119
1911	190	119	85	143	88	119	98	104	51	123
Gradient of the best fitting straight line	2.426		5.568		3.074		0.563		3.188	

(B) Females.

Year	SPECIFIED ORGANS											
	Stomach		Intestine		Rectum		Liver		Uterus		Breast	
	Death-rates	Index Nos.	Death-rates	Index Nos.	Death-rates	Index Nos.	Death-rates	Index Nos.	Death-rates	Index Nos.	Death-rates	Index Nos.
1897	124	87	49	65	50	85	124	92	217	98	143	86
1898	125	88	49	65	50	85	128	94	220	100	148	89
1899	130	92	59	79	50	85	140	103	215	97	152	91
1900	135	95	56	75	52	88	140	103	220	100	154	92
1901	134	94	68	91	55	93	140	103	230	104	155	93
1902	139	98	63	84	56	95	134	99	231	105	165	99
1903	145	102	68	91	62	105	134	99	228	103	171	102
1904	142	100	71	95	60	102	136	100	226	102	172	103
1905	140	99	74	99	64	108	135	100	227	103	168	101
1906	152	107	85	114	63	107	137	101	222	100	169	101
1907	147	103	85	114	62	105	138	102	220	100	175	105
1908	150	106	88	118	65	110	133	98	215	97	177	106
1909	157	111	96	128	67	113	136	100	222	100	185	111
1910	155	109	96	128	65	110	137	101	219	99	185	111
1911	156	110	115	154	65	110	140	103	203	92	184	110
†Gradient of the best fitting straight line	1.657		5.357		2.231		0.314		- 0.223†		1.779	

* See footnote (*) to Table Ia.

† See footnote (†) to Table IIa.

‡ The negative sign indicates that the rate has decreased.

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TABLE VIb.—CORRECTED DEATH-RATE PER 1,000,000 LIVING FROM CANCER OF CERTAIN SPECIFIED ORGANS OF THE BODY, 1897-1911. MALES AND FEMALES.

(A) *Males.*

Year	SPECIFIED ORGANS							
	Stomach		Intestine		Rectum		Tongue	
	Death-rates	Index Nos.*	Death-rates	Index Nos.*	Death-rates	Index Nos.*	Death-rates	Index Nos.*
1897	132	87	40	71	55	78	32	82
1898	140	92	40	71	62	88	33	85
1899	138	90	45	80	61	87	36	92
1900	138	91	47	84	61	86	37	95
1901	150	99	50	89	66	93	36	92
1902	148	98	49	88	71	101	40	101
1903	156	103	50	89	76	108	39	100
1904	159	105	53	94	74	105	37	93
1905	158	104	58	104	72	101	43	109
1906	161	106	65	116	76	108	40	103
1907	153	100	60	106	79	112	41	104
1908	156	102	65	115	78	111	43	109
1909	159	105	73	129	73	103	44	112
1910	164	108	74	131	77	109	43	111
1911	168	111	76	134	78	110	44	113
Gradient of the best fitting straight line †	1.439		4.455		2.121		2.064	

(B) *Females.*

Year	SPECIFIED ORGANS									
	Stomach		Intestine		Rectum		Uterus		Breast	
	Death-rates	Index Nos.*	Death-rates	Index Nos.*	Death-rates	Index Nos.*	Death-rates	Index Nos.*	Death-rates	Index Nos.*
1897	125	90	49	68	51	87	219	101	144	88
1898	126	90	49	68	50	87	222	102	149	91
1899	130	94	59	81	50	87	216	99	153	93
1900	135	97	56	77	52	90	221	101	154	94
1901	134	96	68	93	55	95	230	106	155	95
1902	138	99	63	86	56	96	230	106	164	100
1903	143	103	67	92	61	106	226	104	169	103
1904	140	100	70	96	59	102	223	102	169	103
1905	137	98	72	99	63	108	223	102	164	100
1906	148	106	83	113	61	106	217	100	164	101
1907	142	102	82	113	60	104	214	98	169	104
1908	144	104	85	116	63	108	208	96	170	104
1909	150	108	92	126	64	110	214	98	177	108
1910	147	106	91	125	62	107	210	96	176	108
1911	147	106	109	149	62	107	194	89	174	106
Gradient of the best fitting straight line †	1.189		5.039		1.771		-0.654 ‡		1.318	

* See footnote (*) to Table Ia.

† See footnote (†) to Table Ia.

‡ The negative sign indicates that the rate has diminished.

after-results of operations have been greatly improved; but it is also true that a large, undetermined, proportion of hospital patients are first seen when the disease has advanced so far as to be inoperable. We have, therefore, to set against the saving of lives due to operation the addition to the death-rate of inoperable cases, some of which might not have been diagnosed apart from the hospital. Whether the accounts

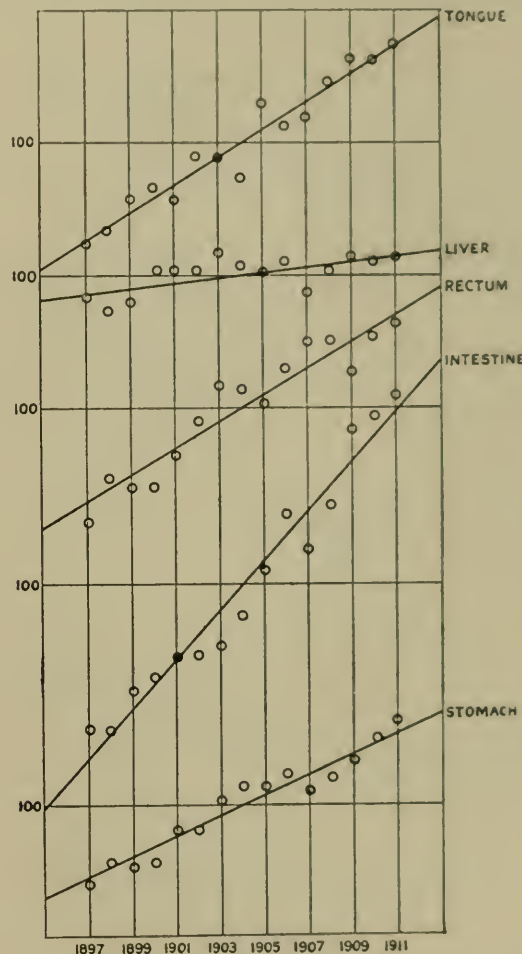


DIAGRAM IVa.

Index numbers showing the changes in the crude death-rates from cancer of certain organs of the body with the best fitting straight lines, 1897-1911. Males.

balance is a point we have no means of deciding. Even so apparently simple a matter as the saving of lives by operation is difficult to study, because all surgeons do not adopt the same criterion of "cure" (see Lewers, pp. 141-142).

The general conclusion deducible from this analysis of site-rates

seems to us to be that such changes as have occurred cannot all be attributed to improved diagnosis combined with a steady incidence of the disease, and we might quote here a remark from the Registrar-General's Report for 1909 (p. xciii): "The increase amongst males from cancer of the jaw, and especially of the tongue, is remarkable, and can scarcely be explained by improved diagnosis. Although cancer of the tongue in its later stages presents little difficulty in diagnosis, the recorded mortality has increased amongst males by no less than

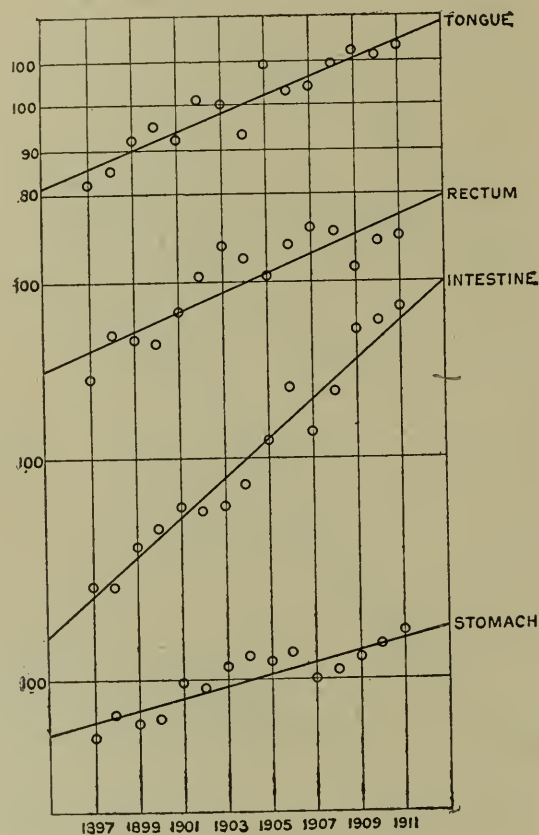


DIAGRAM IVB.

Index numbers showing the changes in the corrected death-rates from cancer of certain organs of the body with the best fitting straight lines, 1897-1911. Males.

228 per cent. in forty-one years. Moreover, the increase is entirely confined to the male sex." Because there has been a real increase in the frequency of cancer of one organ it does not follow that there has been a general increase of the cancer rate; but such an admission should make one cautious in attributing changes in the rate for another organ to a cause group which cannot be directly measured, and does not appear to be operative in the former case.

We next approached the problem from a different side. Let us suppose that the rate of cancer ascribed to the liver in any district is a measure of the diagnostic facilities of that district, that where the liver-rate is high the means of establishing a diagnosis are poor; do we find that where this rate is high the rate for all other sites is low? The data we used were derived from twenty-two Swiss cantons (the

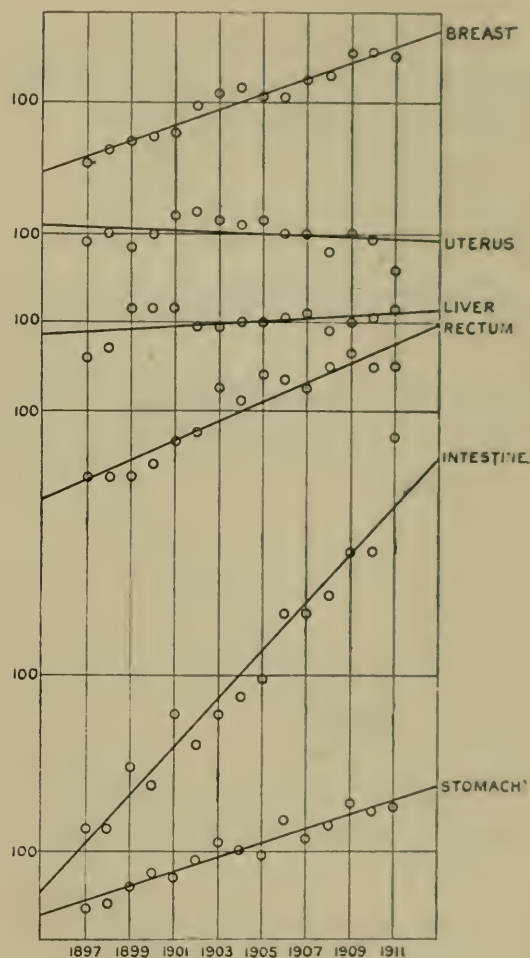


DIAGRAM VA.

Index numbers showing the changes in the crude death-rates from cancer of certain organs of the body with the best fitting straight lines, 1897-1911. Females.

two Appenzell cantons and the two Unterwalden cantons were grouped together, and Uri was omitted owing to its small size), the rates being calculated from five years' returns (females); we could not separate cancer of the liver from cancer of the gall-bladder, which was unfortunate, since the latter condition would not in most cases be a mere secondary deposit, but it is certain that the bulk of the cases must have been cancer of the

liver. The rates were corrected for age-distribution, but our standard rate of mortality refers to all forms of cancer, so that the site-rates could not be separately corrected. Working out the correlation between the liver rate and that for all sites other than the liver, we reach $r = 0.276 \pm 0.133$, a result inconsistent with any really appreciable negative correlation between the variables. In other words, if the liver-rate be a measure of poor diagnosis, the latter is not negatively

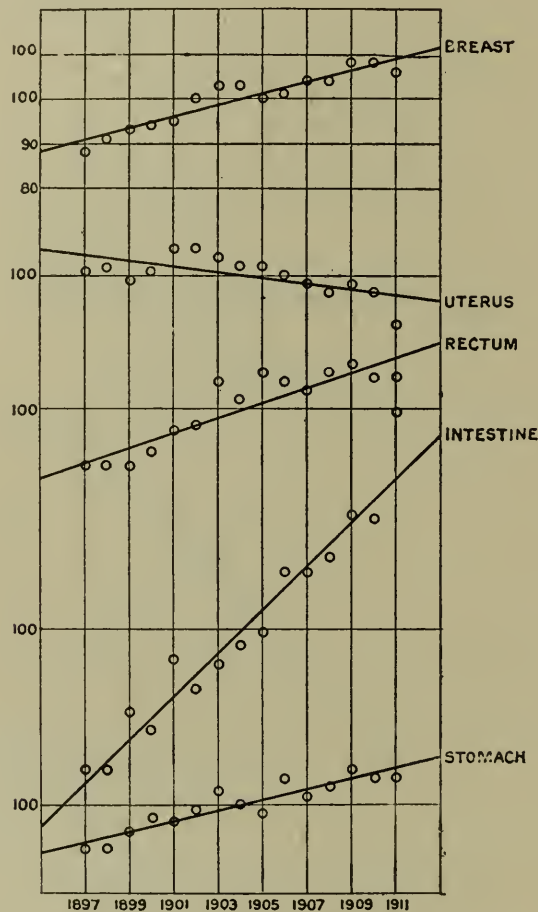


DIAGRAM Vb.

Index numbers showing the changes in the corrected death-rates from cancer of certain organs of the body with the best fitting straight lines. 1897-1911. Females.

associated with the rate of mortality from all other forms of cancer (Table VII). We next measured the correlation between (a) the rates of two inaccessible groups, stomach with rectum and intestine, and between (b), an inaccessible and an accessible group, stomach with uterus and breast. The values are 0.263 ± 0.134 and 0.127 ± 0.142 ; we cannot say that the difference, in view of the probable errors, is

of importance. We have also correlated the liver-rate with that of the stomach, uterus and breast, rectum and intestine, surmising that were the liver-rate a measure of diagnosis the values would be less negative in the case of accessible than of inaccessible sites. The values are: 0.161 ± 0.140 (liver with stomach), 0.145 ± 0.141 (liver with rectum and intestine), and 0.099 ± 0.142 (liver with uterus and breast). The differences are quite without significance.

TABLE VII.—CORRELATION BETWEEN THE CORRECTED DEATH-RATES FROM CANCER OF DIFFERENT SITES OF THE BODY FOR TWENTY-TWO SWISS CANTONS. FEMALES.

Variables	Correlations
Death-rate from cancer of the liver and cancer of all sites other than the liver	$+0.2761 \pm 0.1328$
Death rate from cancer of the liver and cancer of the stomach ...	$+0.1608 \pm 0.1401$
Death-rate from cancer of the liver and cancer of the rectum and intestine	$+0.1454 \pm 0.1408$
Death-rate from cancer of the liver and cancer of the uterus and breast ...	$+0.0994 \pm 0.1424$
Death-rate from cancer of the stomach and cancer of the rectum and intestine	$+0.2631 \pm 0.1338$
Death-rate from cancer of the stomach and cancer of the uterus and breast	$+0.1268 \pm 0.1415$

Means and Standard Deviations.

Variable	Mean rate *	Standard deviation	Variable	Mean rate *	Standard deviation
Corrected death-rate from cancer of the—			Corrected death-rate from cancer of the—		
Liver	12.292	4.582	Rectum and intestine	10.937	3.967
All sites except liver	110.364	23.915	Uterus and breast ...	32.255	8.740
Stomach... ..	47.518	19.527			

* Rate per 100,000 based upon the mean of five years.

Our next investigation is merely recorded as a suggestion, since it depends upon a hypothesis the truth of which is very doubtful. Assuming that diagnosis is approximately uniform throughout Switzerland, then if variations in the general rate of cancer mortality in that country are mainly or largely dependent upon variations in the rates for inaccessible sites, it is plain that the onus of proof is upon those who assert that similar variations in other countries are the effects of differences in the accuracy of certification or diagnosis.

We find in Switzerland that the variability of the stomach-rate is considerably higher than that of uterus and breast combined. The correlation is 0.127, the percentage regression of stomach upon uterus and breast is 0.192 and of uterus and breast upon stomach 0.084. If the stomach-rate be increased 1 per cent. of its mean value, the predicted change of breast- and uterus-rate will be 0.084 per cent. of their mean. Conversely if the uterus-breast rate be increased 1 per cent., the predicted change of the stomach rate will be 0.192 per cent. of its mean. On the above hypothesis these results show, we think, that there is little interdependence between changes in the two rates, and afford an additional argument in support of the view that circumstances, apart from diagnosis, which affect one rate will not influence the other. With regard to the proposition that variations in the general rate chiefly depend upon variations in certain sites, we may refer to the paper of Prinzing cited above.¹ We may add that although we have here discussed the problem which is of most popular interest—viz., changes in the *general* rate of cancer mortality—we conceive that a more fruitful line of research is to analyse the local and secular changes in the rates of particular sites, in view of their largely independent variability.

This concludes our series of tests, and we may proceed to sum up the case presented. The argument that the recorded increase of cancer is not a consequence of a really increased incidence is founded upon three main propositions, viz.—(1) The manner in which the male rate has overtaken the female rate; (2) the marked increases in the rates for certain inaccessible sites; (3) the exceptional position of London in respect of cancer mortality among males.

With respect to (1) we think we have shown that this change in relative position of the sexes is difficult to reconcile with so simple an explanation as that diagnosis is easier in the case of females and earlier became constant; there is reason to doubt whether the rate for even so accessible a site as the uterus is not sensibly affected by facilities for precisising a diagnosis, and further the very different courses pursued by the uterus and breast rates require to be explained.

With respect to (2) we have shown that the rate of increase is not uniformly greater in the case of inaccessible sites, that in particular the rates for the tongue in males, and for the breast in females, have advanced in a manner inconsistent with the *general* validity of the proposition as applied to all forms of cancer, with a consequence that

¹ See also Kolb's paper.

the attribution of the great increase in certain other inaccessible site rates to improvements in diagnosis becomes arbitrary.

With respect to (3) our study of the county rates seems to prove that the position of London is not exceptional, and that in particular we can hardly suppose that extra-metropolitan districts are now upon the plane occupied by London twenty or thirty years ago.

TABLE VIII.—CORRECTED DEATH-RATE PER 100,000 LIVING FROM CANCER OF DIFFERENT SITES OF THE BODY IN TWENTY-TWO SWISS CANTONS BASED UPON THE MEANS OF THE FIVE YEARS, 1901-05. FEMALES.

Canton	CORRECTED DEATH-RATE FROM CANCER OF THE FOLLOWING SITES				
	Liver	All sites except liver	Stomach	Rectum and intestine	Uterus and breast
Zürich	12.74	144.8	67.8	12.18	40.8
Bern	10.62	93.8	30.8	9.54	31.6
Luzern	24.06	118.2	52.8	10.46	30.2
Schwyz	17.00	111.0	49.0	11.10	22.8
Obwalden }	8.60	115.6	57.8	7.38	21.0
Niedwalden }					
Glarus	18.20	101.8	25.6	9.64	30.0
Zug	13.44	107.2	97.2	11.96	34.4
Freiburg	8.36	100.6	38.2	9.24	31.6
Solothurn	11.22	111.4	46.4	12.82	31.6
Basel Stadt	13.54	128.2	42.8	15.36	40.6
Basel Land	16.72	83.6	21.0	5.58	34.6
Schaffhausen	17.56	109.6	45.2	13.38	34.2
Appenzell a/R }	11.36	163.6	91.6	14.52	36.6
Appenzell i/R }					
St. Gallen	12.56	127.0	66.6	8.66	26.6
Graubünden	7.78	99.8	44.0	8.10	26.2
Aargau	15.22	97.6	45.8	9.08	26.0
Thurgau	14.00	118.6	56.6	10.04	30.4
Tessin	4.80	78.4	33.8	5.66	25.4
Waadt	8.98	112.8	40.4	13.18	38.2
Wallis	4.00	43.2	16.6	3.66	12.6
Neurenburg	10.84	128.6	36.8	20.60	47.4
Genf	8.82	132.6	38.6	18.48	53.8

Finally, the Swiss data, so far as they go, cause us to think that the scientific importance of comparisons between the rates for all forms of cancer is less than the general public, or even the medical profession as a whole suppose. This belief leads us to support the policy of the Registrar-General, advocated by the authorities of the Imperial Cancer Research Fund, of publishing separate tabulations of the site-rates, and to advocate the carrying of this tabulation even further than has yet been done—e.g., by the introduction of tables showing the site-rates in some of the larger administrative subdivisions. The general

conclusion to be drawn from our work is, we think, that there is some truth in the popular opinion that the real incidence of cancer has increased. We do not desire to minimize the importance of the sources of error pointed out by King, Newsholme, Bashford, Murray and Stevenson, and we are conscious that our statistical method is by no means so precise as we could wish. The general tenour of the results does, nevertheless, create a presumption in favour of the conclusion we have enunciated. We may, at least, claim that a sufficiently strong case has been established to render the alleged increase of cancer a suitable topic for discussion by a learned society rather than a mere illustration of the fallacies resulting from the unskilled treatment of medical statistics. If this claim be admitted, the purpose of our paper has been fulfilled.

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DISCUSSION.

The PRESIDENT (Dr. W. H. Hamer) said Mr. Greenwood had informed him that the paper would only contain "just what was to be expected"; but the Section would agree with him that, from the two authors concerned, the Section was entitled to expect the unexpected, and, in point of fact, they had enjoyed a treatment of the subject more original and unexpected than they could possibly have anticipated would be presented to them. He was, in any case, inclined to doubt the correctness of the view that the ordinary practitioner was not better able to diagnose cancer now than he was fifty years ago; but even if the statement were correct, there remained the very important consideration that what was in a practitioner's mind might, at one and another time, be varyingly expressed upon a death certificate. Changes of type and changes in recorded amounts of prevalence, as had been well said, depended upon the mental revolutions of practitioners far more than upon the actual revolutions of disease. Statistical methods could only be applied to the particulars recorded, and it was important they should recognize to how small an extent the records represented actual facts. A little London girl who visited a dairy farm in the country said she understood now how they got the milk out of the cow, but she would like to know how they got the milk into the cow. A similar sort of difficulty was apt to assume very great importance in connexion with most of the problems of medical statistics, and in this respect at least cancer was a disease presenting quite exceptional peculiarities. In the first place, in cancer more than almost any other disease the question arose as to whether the diagnosis should be revealed, and opinion in this matter had apparently undergone considerable change in the last forty or fifty years. Then, in the second place, cancer was a chronic disease, and patients were apt to die from other causes. In the somewhat similar case of phthisis it was interesting to find the fact stated in Dr. R. Dudfield's last annual report that on nearly a fifth of the death certificates of individuals known to him to have been reported to be suffering from phthisis, the primary, and in some the only, certified cause of death was a disease other than tuberculosis. And then in the third place, there was the question of operation. Fifty years ago operative interference was rare, nowadays quite a large percentage of cases underwent operation. The "suggestions" made to certifying practitioners by the Registrar-General on the back of the death certificate made special reference to the procedure to be adopted in filling up the certificate when death occurred after operation. This, in itself, must have led to considerable addition to the number of instances in which the fact that a patient had suffered from cancer found expression on the death certificate. For these reasons he (the President) thought that the likelihood of the diagnosis formed in the mind of the

practitioner being actually placed upon paper, and of cases of cancer thus being caught in the Registrar-General's net, was far greater now than it was fifty years ago; this was so even if it were assumed—and it was a very doubtful assumption—that the diagnostic skill of the average practitioner had not greatly improved. He would call upon Dr. Stevenson to open the discussion.

Dr. T. H. C. STEVENSON said he had listened with much interest to Mr. Greenwood's and Mrs. Wood's paper, on which he had only one or two remarks to offer, and those chiefly relating to his own personal connexion with a portion of its subject-matter. From the manner in which his contribution on the subject of cancer to the last Annual Report of the Registrar-General had been referred to in the paper, he was a little afraid that it might appear that he had there taken up a definite position in favour of the view that cancer mortality is not increasing in this country, and that he claimed to support this view by arguments deduced from the figures there quoted. So far from this being the case, he believed that the one fact with regard to this question which emerged with something approaching certainty from the study of the official records was that cancer of certain parts of the body—the tongue at all events, if not others—had increased, and in view of this fact very strong evidence would be required to support a definite conclusion against the increase of cancer in general. With the permission of the meeting he proposed to read some of the context in which his question, quoted by the authors of the paper, was set. "While the figures for a single year would be far too small a basis for forming a definite conclusion on this matter, and there is evidence pointing to a real increase of cancer of certain parts of the body, the figures for 1911 seem to harmonize sufficiently well with the hypothesis that recorded differences in mortality depend upon varying degrees of accuracy in diagnosis to make it worth while to watch those of subsequent years from the same point of view. If these latter point in the same direction then we must ask ourselves whether E. and W. in 1911 does not compare with E. and W. in 1881 more or less as London in 1911 does with the rural districts in 1911." It would be seen that the question was not even put, but merely suggested as one which, under certain circumstances, might have to be put in the future. To bring forward an elaborate array of statistical calculations in order to counter such a hypothetical possibility of a question as this, seemed to him like using a very heavy steam-hammer to crush a very small nut. He wished also to refer to the suggestion that the mortality records of different areas should be tabulated according to the part of the body affected. There would be no difficulty in doing so for the years 1911 onwards, when the system had come into operation in the General Register Office by which each death registered was represented by a card, which in the case of cancer bore a record of the part of the body affected. It would hardly be worth while, perhaps, to undertake such work until the records of a few years had accumulated, unless the areas compared

were to consist of large aggregations of districts, but in any case, the cards were at the disposal, at any time, of Mr. Greenwood or of any other responsible investigator who chose to take the matter up. To his mind, indeed, this feature of the 1911 Report of the Registrar-General was of far greater importance in its bearing on the cancer problem than any theorizing as to cancer increase, since it meant that the national records had for the first time been put into an adaptable form which would permit of valuable investigations such as that now suggested. In conclusion, he wished to associate himself with all that had been said by the President as to the interest and value of the paper.

Dr. E. F. BASHFORD: In the first place I should like to associate myself with the remarks of our Chairman and Dr. Stevenson on the value of Mr. Greenwood's and Mrs. Wood's paper. To those who, like myself, are deeply immersed in the study of cancer, the accession of valuable outside students is especially important, because of the very great caution we exhibit in expressing decided opinions. Mr. Greenwood concludes his paper by stating "a sufficiently strong case has been established to render the alleged increase of cancer a suitable topic for discussion by a learned society rather than a mere illustration of the fallacies resulting from the unskilled treatment of medical statistics." When King and Newsholme published their paper there was great necessity for exposing the fallacies resulting from the unskilled treatment of medical statistics, and the same necessity obtained when the investigations of the Imperial Cancer Research Fund were instituted. I agree with Mr. Greenwood that the publication in 1893 of a paper by King and Newsholme marked an epoch in the discussion of the question of the increase of cancer. Previously the discussion had been carried on somewhat loosely and largely by surgeons who certainly had not the accurate knowledge of the pathology of the disease which we possess to-day, and often were ignorant of statistical methods. In view of the more extensive data available to-day, the value of King and Newsholme's paper appears to me to lie, not in discussing whether they were right or wrong in concluding in 1893 that the increase of cancer was apparent and not real, but in the stimulus they gave to accurate discussion. They showed that the matter could only be discussed by comparing the deaths from cancer according to the numbers living in each age-period for the two sexes separately in the several decennia compared. They insisted that the difficulties in diagnosing and certifying cancer as a cause of death were greater for some parts of the body than for others, by grouping them into what they termed "accessible and inaccessible" sites. Of course the incidence of cancer had been considered according to separate sites earlier, notably by Ogle, but he stated that he did not think the expense and labour involved in doing so would justify the undertaking. At a later date this difficulty was overcome, and thus it is possible for Mr. Greenwood to-night to discuss in detail whether there has been an increase of cancer for certain parts of the body, or not. At the

beginnings of the investigations of the Imperial Cancer Research Fund the question had to be considered whether or not a cancer census should be instituted similar to that which had been taken in Germany. The conclusion was arrived at that this would fulfil no useful purpose and was an erroneous method. Instead it was decided to do what one could to encourage and, if possible, help the National Statistical Office in publishing more detailed data, particularly those referring to the incidence of cancer in different parts of the body. With this object, special investigations were undertaken as regards hospital statistics, not only in London but throughout the Empire. The early investigations into the occurrence of cancer in mankind speedily brought out the fact that the practices of different native races modified the anatomical distribution of the disease as known in Europeans. I am almost ashamed to repeat once more that some of these practices can almost be dignified with the title of unintentional experiments, notably the application of the Kangri to the skin of the abdomen in Kashmir, causing epithelioma to occur in a site from which it is absent in Europe and America. The chewing of betel-nut by the women in India makes them as liable to cancer of the floor of the mouth as men, a circumstance which does not obtain in Europe. The same may be said of the consumption of very hot rice by men in China leading to the development of epithelioma of the œsophagus, from which the women do not suffer, it is said, because they are served when the rice has already become cold. In animals, also, similar unintentional experiments obtain, the cow affording two instructive examples: the waggon is hitched to the right horn of draught cattle in India and epithelioma develops there and never at the left horn. In some parts of this country and Ireland cirrhosis of the liver is common in cattle, and on this cirrhosis there develops with great frequency adeno-carcinoma. The demonstration of these variations makes it necessary to admit the possibility of others, both in time and place. Observations on animals and experiments soon threw fresh light on the significance of the age-incidence of cancer, and the importance of considering the age-incidence for each organ separately.

I have not read Mr. Greenwood's paper with very great care, but I have marked one or two sentences on which I may be permitted to comment. It is said that general practitioners have no greater facilities for diagnosing cancer to-day than they had fifty years ago. I would point out that there has been a very great advance in the means of diagnosing other diseases, and as the diagnosis of cancer is still largely arrived at by a process of exclusion, this must unconsciously influence the general practitioner. There has also been a very large increase of beds in hospitals. I do not know if exact figures can be obtained for England, but they have been published for Germany, and there the increase has been enormous. This increase has coincided with the development of surgery, with the disappearance of the reluctance of surgeons to operate for cancer, and diminished fear of operations by patients themselves.

These facts also must have reacted upon the diagnosis of cancer by the general practitioner, quite apart from the general improvement in the accuracy with which all deaths are certified. I do not think that it is worth while discussing the increase of cancer upon the basis of the number of patients treated for it in hospitals. This is a matter into which I inquired some years ago. It was evident no estimate whatsoever was possible as to the population the cancer patients were drawn from and no basis for comparison could be obtained. The question of medical practitioners not being in a better position to diagnose cancer is raised a second time, and Mr. Greenwood inclines to the view that it is true that there are no improved facilities for diagnosing cancer. I do not agree with this statement in this bald form. It must be remembered that the way in which the term cancer is used to-day is very much more precise than it was fifty years ago or even thirty years ago. To take an example, I have here a paper by Waldeyer published in 1873. I select it because Waldeyer is the oldest and most distinguished investigator of cancer still living. He points out how cancer was originally purely a clinical term of vague meaning, and that a few decennia earlier the question of the real distinctions between cancer and other new growths had hardly been discussed apart from the superficial separation of certain external forms, such as scirrhus, medullary cancer, and fungus hæmatodes. Johannes Müller's definition was mainly clinical. Waldeyer quotes Hughes Bennett, who in the first book published on the histology of cancer in this country in 1849 wrote: "When we endeavour to define what a cancerous growth really is, according to the descriptions of morbid anatomists, or the symptoms of medical practitioners, we are at once thrown into a crowd of inconsistencies from which the sooner we emancipate ourselves the better."¹ I am familiar with the important literature from this time onwards, and it is quite easy to trace the progress by which our conceptions of cancer have been more clearly defined. This has been particularly due to the development of morbid anatomy and the greater frequency with which post-mortem examinations are made. Previous to accurate histological examination the relationship between cancer and its mother tissue had not been determined, and in this connexion it must be remembered that it was not till near the end of the seventies that the actual staining of tissues was introduced. The improvements of surgery have also contributed to our knowledge of the nature, origin, and spread of cancer, and they, too, have also been taking place within the last fifty and even thirty years. In 1884 the late Sir James Paget was unwilling to admit the truth of the statement that cancer was spread in the body by transportation of cells from the primary focus, and still maintained it was a constitutional disease due to some morbid product in the blood, although he

¹ In the preface Hughes Bennett writes: "No one can doubt that this disease is frequently confounded with epithelial, fibrous and other forms of growth, and that, up to the present time, practical men have no ideas sufficiently fixed and positive to govern their conduct in many important and dangerous cases."

had then sufficiently modified his views as to admit the possibility that this "morbid product" might be microbic.

The recorded increase in cancer is in marked contrast with the great diminution in the deaths attributed to tubercle and various other diseases, loosely classified as "wasting," "decline," and so on, and I note that in the literature, already referred to, much attention is devoted to the differential diagnosis of cancer from tubercular nodules: it may be that some of the diminution in tubercle is due to the transference of cases to cancer owing to more accurate diagnosis. As regards the age-groups among which the increase is recorded, it may be worth while pointing out that ten years ago the belief was held in Germany by distinguished persons that the most alarming feature of the increase of cancer was its increasing frequency in younger age-groups. This conclusion was not then in accordance with the English vital statistics, and quite recently I notice that figures have been published for Germany showing that in that country also the increase is most marked in higher age-groups.

As regards Mr. Greenwood's curves, there is only one to which I would like to make reference. If I understand Mr. Greenwood rightly, he draws a contrast between London and Somerset in the following way: If improved diagnosis were a factor responsible for the increase in the number of deaths recorded from cancer, then the rate of increase should be greater for Somerset than for London, because it lags behind London. In other words, the curve for Somerset should be steep and that for London should show a flattening on account of the operation over a longer period of the greater facilities enjoyed in the metropolis. But we are entirely ignorant of the absolute incidence of cancer, and therefore I should like to ask Mr. Greenwood whether he has considered the possibility that—owing, as it were, to there being a great deal of slack to take up in London—the greater facilities obtaining in London might still cause a more rapid improvement in London than in Somerset. When considering institutional deaths, Mr. Greenwood leaves out workhouse infirmaries and workhouses, but it has been my experience that there are workhouse infirmaries and workhouses in which a large number of deaths do occur from cancer and come to autopsy.

The increase in mammary cancer contrasted with the standstill or actual fall in deaths from uterine cancer raises a very important point. We do not know what the absolute incidence of cancer is. For those sites of the body which are very easily accessible to complete examination—e.g., the skin and uterus—and which do not show any increase or actually show a fall, it may be that we have approximated very nearly to the absolute incidence of the disease, and that, therefore, the effects of successful operation are beginning to show themselves. While mammary cancer is much more difficult to diagnose than uterine cancer, and is certainly diagnosed more frequently at a later stage than is uterine cancer, it is difficult to express an opinion whether an increase is or is not taking place. The matter has been discussed from the

standpoint that the diminution in the number of childbirths may favourably affect the fall in the uterine rate, whereas the inability or unwillingness of women to suckle their children may not be unassociated with an increase of mammary cancer. It is worth while pointing out that in 1906, in a paper I read before this Society, I showed for three different age-groups that cancer of the uterus had been for a number of years diminishing in Berlin. It would therefore appear that for the uterus at any rate the phenomenon is one of general occurrence. In the case of the increase of cancer of the tongue it must be pointed out that, in contrast to the uterus, operation is here conducted under very great disadvantages. With the late Sir Henry Butlin, Murray and myself investigated very carefully fifty-six of the earliest epitheliomata which it was possible for us to obtain. Although some of these growths were no more than 2 or 3 mm. in diameter, and the lymphatic glands were removed, the results of the operation were often unfavourable. Owing to the unfortunate premature death of Sir Henry Butlin I am not in a position to give the exact results, but, speaking from memory, my impression is that in less than half of the cases was recurrence absent and patients still alive and well at the time of Sir Henry's death.

On the whole Mr. Greenwood's paper supports the views I have expressed that the increase recorded in the number of deaths from cancer is not uniform for all parts of the body, and that it is wrong to speak of an increase of cancer as a whole. It bears out, further, the conclusion that the problem can only be solved by considering each site separately. Some years ago this question was raised in connexion with the occurrence of cancer in different occupations, and owing to financial questions involved, the Imperial Cancer Research Fund undertook to provide money in order to have the data which existed in the Registrar-General's office abstracted. Subsequently it was found possible to provide the financial necessities from other sources. Mr. Greenwood raises the question of the value of tabulating the deaths from cancer for the several sites in separate administrative divisions. I have already drawn attention to this point. Dr. Stevenson has just stated that the data for different parts of the body are available for separate areas, although he does not consider the present time is favourable for having them tabulated. When it becomes advisable to have these additional data abstracted, I should deem it a question worthy of raising before the Executive Committee of the Imperial Cancer Research Fund whether financial assistance should be given, if required. On the whole, I am inclined to think that some of the problems connected with the increase in the number of deaths recorded from cancer come before us in a form in which we really cannot solve them, because we do not know what the absolute incidence of cancer is, and we cannot get hold of the primary data we require for the human subject with sufficient accuracy. Hence for many years breeding experiments have been conducted in our laboratories by Dr. Murray. He has now bred some 3,000 mice, and has collected very accurate data regarding the absolute incidence of cancer in

these animals as regards different parts of body, age, and the influence of heredity. Having got data as to the absolute incidence of the disease it becomes possible to study what factors modify its frequency, increasing or diminishing it—e.g., chronic irritation. It may be years before we have definite information on this subject, but much may be attained before some of the problems we are discussing in regard to mankind have advanced from the position in which they now are.

Before sitting down it would be unfair of me were I not to pay a tribute to the willingness with which Dr. Tatham and Dr. Stevenson have assisted the investigations of the Imperial Cancer Research Fund.

Dr. HORST OERTEL: Allow me first to thank you for having given me the opportunity to listen to, and profit by, this interesting and instructive paper with its illuminating discussion. I speak with some feeling in this matter, because I come, as you know, from a country in which the scientific treatment of medical statistics is, on account of political, administrative, and educational difficulties, which have only lately been justly criticized by Dr. Bashford, still in its infancy. England, on the other hand, has made great advances in this branch of statistics, and is to-day a well-recognized leader in this movement. The preceding discussion has left very little unsaid, and I could add nothing of value to the statistical questions, but I may perhaps be allowed to say a few words about the diagnosis of cancer. This, it seems to me, is a point which must not be overlooked or taken too lightly in the treatment of cancer statistics. I agree with those who believe that there has been an improvement in the diagnosis of cancer during the last twenty-five years, perhaps not in so far as the opportunities of the general practitioner to verify his opinion by autopsy are concerned, but more especially in the better crystallization of our conceptions of cancer; twenty-five years ago these were, at least in the mind of the general practitioner, more hazy than to-day, for pathologists had only laid down our modern conception of cancer a short time before. But there is perhaps to-day a tendency to diagnose cancer a little too frequently, and cancer shares in this respect the fate of certain other diseases when brought to the immediate focus of the public eye. At any rate, I have noticed that during an epidemic, when attention is centred on a disease, an almost hypnotic influence seems to prompt a diagnosis when it would under ordinary circumstances not have been made. However, I have also observed the very opposite, for physicians sometimes hesitate to certify to certain diseases like cancer, tuberculosis, syphilis, and diabetes, on account of regard for family or other more personal reasons. I rather think that this is decreasing, but I believe that it entered at one time, and not very long ago, into the errors of vital statistics. Finally, it must be remembered that the diagnosis of cancer is really a most difficult one, that it requires careful training in pathological anatomy, and that frequently mistakes are made even at autopsy which are cleared up only by subsequent painstaking microscopical examination. It is, of

course, impossible to say whether these various sources of diagnostic error may balance each other in the end. Permit me to say in conclusion that whatever inaccuracies and deficiencies may attach to the present methods of vital statistics, the grave consideration which they have received of late by such societies as yours has aroused the majority of the medical profession to their responsibility in the matter, a responsibility to which only too few devoted serious attention in the past.

Dr. FARRAR pointed out that the improvement in surgical technique which had taken place during the last generation must have saved a very considerable number of lives among cancerous persons who after the removal of cancerous growths survived to die ultimately of some different disease. He specially instanced, and illustrated from his own experience as a general practitioner, cancerous growths of the uterus, tongue, and mammae. Only a generation ago uterine cancer was regarded by leading surgeons as "inoperable." The saving of life by operations on such cases, while not reducing the real incidence of cancer, must certainly tend to reduce the apparent death-rate from this disease, and would, to some extent, counterbalance the apparently increased incidence due to improved means of diagnosis.

Dr. DAVID HERON: I should like first of all to call attention to the fact that in Tables IA and IB the sexes have been grouped together, although it is now generally recognized that in any discussion of disease rates they should be dealt with separately. If we look, for instance, at Table IIB, we see that the male cancer death-rate in London in 1901 was 864 per million, while the female death-rate was 1,092 per million. Further, while the male rate increased in ten years to 1,058, the female rate showed a slight decrease. There is thus considerable danger in averaging rates which differ so markedly. In the second place, it is axiomatic in modern statistical work that whenever we sum up any of the features of a series of observations in a single number, we should always make some statement as to the weight that is to be attached to such a constant. An average, or a correlation coefficient, should always be accompanied by a probable error in order that we might know the probability that any value of the constant concerned might arise from pure chance. The constant which is used throughout this paper is a "gradient," actually the slope of the best fitting straight line to the index numbers of the various series of death-rates, and unfortunately the authors do not give any indication of the relative significance of the differences between the various gradients on which their conclusions are based, although these gradients are based upon short series of 10, 15, or at most 20 death-rates, all of which are subject to errors of random sampling as well as to changes in local conditions. To take an example: In dealing with Table IIB, the authors state on p. 136 that they "undoubtedly find a somewhat different state of affairs, since now there is a general distinction between the urban counties on the one hand and the

rural on the other. For males, all the urban lines show a less steep gradient than do the rural ones, precisely as we should anticipate on the simple hypothesis, and there is a similar distinction in the case of females." Turning now to Table IIB, and confining our attention to male deaths, we find that the lowest gradient among the urban counties is 1.273 in the case of Northumberland, while the steepest gradient among the rural counties is 2.030 in the case of Somerset, the assumption being that there is a significant difference between these two gradients. I have endeavoured to illustrate these gradients in diagram form in fig. 1. The continuous lines give the best fitting lines in each case, while the dotted lines give those with which they are to be compared

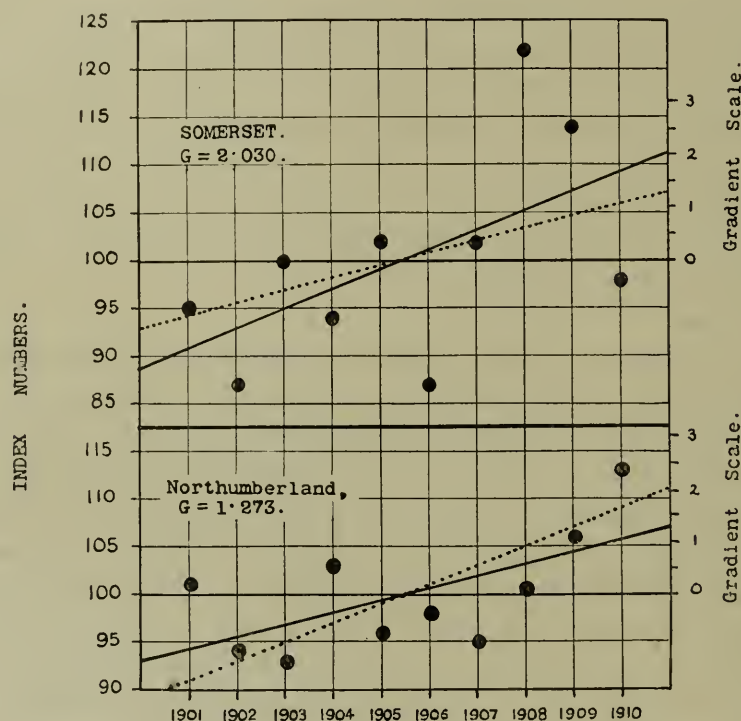


FIG. 1.

Index numbers of the corrected death-rates from cancer in Somerset and Northumberland with (a) the best fitting straight lines (continuous lines) and (b) the lines with which they are to be compared (dotted lines). Males, 1901-10, Table IIB.

compared. Now the authors' contention is that the gradients in those two cases are significantly different, but in each case the dotted line appears to give practically as good a fit as the continuous—i.e., as the best fitting straight line. If we measure goodness of fit by the root mean square deviation, we find that in the case of Somerset this constant is 8.65 and in the case of Northumberland 4.60, and any line with a slope between -1.2 and $+3.8$ will give a better fit to the Northumberland data than the best fitting straight line

to the Somerset data. In such circumstances comparisons of the gradients of these lines should be made with the greatest caution. What is needful is some measure of the weight to be attached to the gradient in each case, and until this has been supplied we cannot tell whether the differences between the gradients are significant or not. The authors tacitly admit the need for some measure of this kind, for they leave out from Table IB the figures relating to Wiltshire, "the results for which in the case of crude rates seemed to argue that the population at risk was too small to afford reliable indications" (p. 133).

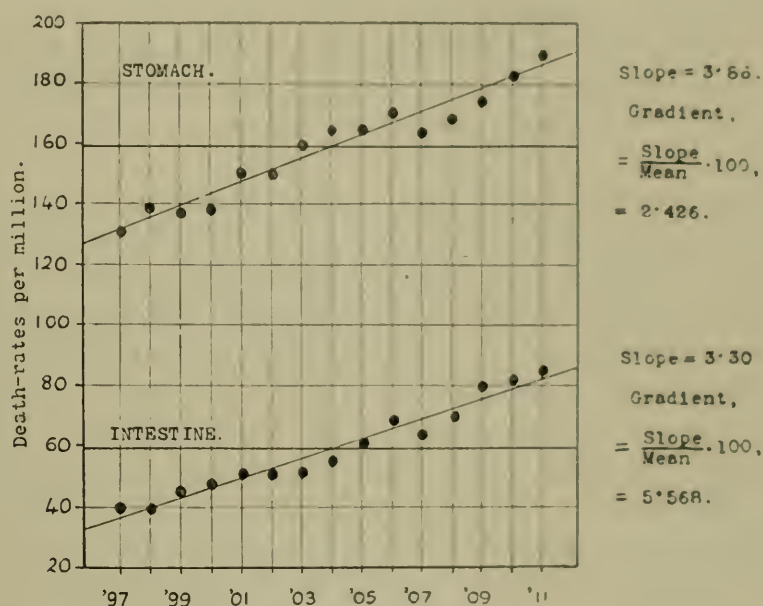


FIG. 2.

Crude death-rates from cancer of stomach and intestine with the best fitting straight lines. Males, 1897-1911, Table VIA.

If we examine the constant used throughout the paper, the gradient, we find that it is actually—

$$\frac{\text{Average Annual Rate of Increase of Cancer Death-rate}^1}{\text{Average Cancer Death-rate of the Period.}}$$

The gradient is thus made up of two factors which may vary independently, and even if the annual rate of increase remained constant, a difference between the average death-rates in two areas or sites would cause a difference between the gradients. Thus in Table VIA it is stated that in cancer of the stomach in males the gradient is 2.426, while in cancer of the intestine the gradient is 5.568, but if we examine the actual death-rate as shown in fig. 2 we find

¹ Deduced from the slope of the best fitting straight line to the death-rates.

that the slopes of the best fitting straight lines are much the same (3·86 and 3·30), but since the average values are widely different (159 compared with 59) the gradients are also widely different. The differences between the gradients thus appear to be very largely due to differences between the average values of the death-rates, and it is these averages which the authors are really comparing if the slopes of the best fitting lines to the death-rates are nearly the same. I think, therefore, that the absence of any method of testing the significance of the differences between the gradients and the very grave doubt as to the propriety of using the gradients of these index numbers at all should make us unwilling to accept, without much more investigation, the authors' conclusions. Only when the statistician starts with a thorough mathematical training will it be possible, as the authors of this paper suggest, to avoid the fallacies which result from the "unskilled treatment of medical statistics."

Dr. DUDFIELD said he had read the paper before the meeting with much interest, but he had to admit that he did not possess the mathematical knowledge required to recognize the omissions and errors on which Dr. Heron had animadverted so severely. He (Dr. Dudfield), while holding the view that there had been a real increase in the mortality from cancer, thought that some of the recorded increase was probably the effect of changes in classification, a view which he thought was supported by the sudden increases in rates given in Table IB about the years 1889 and 1890. A similar explanation had been adduced with reference to the enormous increase in the recorded mortality from injury at birth to which he had recently called attention in the *Journal of the Royal Statistical Society*. The practice of making special inquiries with reference to certificates of causes of death had admittedly brought out, in a considerable number of cases, the fact of death being due to cancer, although that cause was not mentioned in the original certificate. That practice was undoubtedly more general now than formerly, and might be considered to be a further cause productive of some of the increase. His own experience with regard to such inquiries—not by any means limited to cancer—had convinced him of the urgent necessity of making the certificate of cause of death a confidential document—not accessible either to the relatives of the deceased or to insurance offices. He adverted to the Swiss practice in this respect, but hoped that it would not be found necessary to follow that practice absolutely and so deprive local medical officers of health of the information they now obtained. He thought the certificates should be sent to the medical officers of health. The authors had referred to the supposed superiority of death certification in hospitals and other institutions resulting from post-mortem examinations. His experience was that the death certificate was generally issued prior to the making of such an examination. He had not infrequently ascertained that a post-mortem examination had disclosed a very different cause of death to that stated in the official certificate, but, so far as he knew, no steps were taken to amend the certificate.

There was one aspect of the subject to which the authors had not alluded to—viz., to what extent was the increase in the expectation of life responsible for the increase in cancer? As death inevitably followed birth, it was simply a question as to which of the many trap-doors seen in the Bridge of Life described in the Vision of Mirzah became the channel from life to death. If those in the arches of youth and adolescence were safely passed over, those to be found in the arches of old age (among which was the trap-door labelled "cancer") snatched the survivors. The subject of the evening's discussion had been the *mortality* from cancer. That he thought had increased, but had there been a corresponding increase in the *prevalence* of cancer? In his opinion there were no data at present on which to found an answer to that question. The only possible source from which the necessary information could be obtained lay in the statistics of hospitals and other institutions. In the Report of the Committee on Morbidity and Mortality Statistics issued last year by the Royal Statistical Society attention had been directed to the absence of any serious attempt, except at two or three of the largest hospitals, to make use of the very valuable statistical data available. It appeared to him that there was an urgent need of a central statistical organization to collate such statistics, and he had some hope that at no distant date a scheme would be formulated in that direction. As early as 1840 attention had been called to this subject, but realization was still to come. That the statistics when properly collated ought to yield much instruction was, he thought, obvious. The size of the sample—some 120,000 in-patients passed through the London hospitals each year—was sufficient to furnish results fairly free from errors of sampling.

Mr. MAJOR GREENWOOD, jun., and Mrs. FRANCES WOOD (reply): The hope that our paper would initiate a good discussion has been fulfilled, and we desire cordially to thank all who have taken part in it. We think the President has attributed to us a somewhat more dogmatic attitude on the subject of diagnosis than our actual words imply. We merely say, "We do not think that the progress of research has placed in the hands of the ordinary practitioner direct means of diagnosing cancer not available even so long as fifty years ago." We are sorry if the wording of our paper seems to attribute to Dr. Stevenson a more decided opinion respecting the cause of the change in the recorded cancer rates than he holds. We did not intend to convey such an idea and merely singled out his hypothetical question because it crystallized a view which seemed to us peculiarly intelligible and useful as a working hypothesis. We tender our apologies to Dr. Stevenson for our unintended misrepresentation and have inserted an explanatory footnote to the text.

Dr. Bashford's speech was heard by everyone with the greatest interest and we have learned much from it. His masterly exposition of the reasons which made it desirable to abandon the discussion of cancer rates *en masse* and

almost imperative to confine attention to site-rates amply justifies the doubts expressed in the concluding portion of our paper. With regard to the question he asked, our point was that if improvements of means for effecting a diagnosis had been generally operative, we should have expected the more backward counties to improve faster than the better educated ones, just as in many branches of education progress is rapid up to a certain point and then becomes slower. We agree, however, that such a rule may be subject to numerous exceptions.

Dr. David Heron's criticisms fall under three heads: (1) We have not computed the "probable errors" of the constants of the straight lines applied to the index numbers. (2) We fitted lines to index numbers instead of to rates. (3) In one section an argument is based upon rates in terms of persons. Dr. Heron appears to us to attach to the term "probable error" a meaning which the majority of statisticians would repudiate. If we take a random sample of adult Englishmen, measure their heights, and say that the average stature is a , with a "probable error" of $\pm b$, we imply that we should not be surprised were other samples to exhibit mean values which diverge from that of the first within limits assigned by the magnitude of the "probable error," and that we are only entitled to infer that the "real" mean of the whole population falls within certain assignable limits. Had we measured the whole population of living adult Englishmen, the average value obtained would have been an exact quantity, within the limits of errors of measurement which are not, of course, defined by the computed "probable error," and the "probable error" of the mean would have been zero. This is precisely the state of affairs in the instance of our site-rates, the data are the true *recorded* proportions in the whole population during the period under examination; the series of values is not random, and does not consist of samples, hence the question of "probable errors of random sampling" does not arise. The case is evidently analogous to that studied by Professor Karl Pearson in his pamphlet, "The Fight against Tuberculosis and the Death-rate from Phthisis" (Dulau and Co.). Professor Pearson published three diagrams: (a) The general death-rate of England and Wales; (b) the phthisis death-rate; (c) the ratio of phthisis deaths to all deaths. The original figures seem to have been the crude rate for males and females separately from 1835 onwards. Each series is divided into approximately the same periods—viz., 1835-66, 1866-91, and 1891-1910, and "with the kind help of Miss Ethel Elderton, regression straight lines have been fitted to the graphs" of these periods. Various important deductions are made from the varying slopes of these lines, some of which, so far as we have been able to test them, do not fit the observations better than some we have employed in our own problem. Professor Pearson, like ourselves, appears to have been under the impression that the theory of random sampling had no direct bearing upon the problem he desired to solve, and his offence in Dr. Heron's eyes must have been more heinous than ours, since he was addressing a popular audience unlikely to realize the

enormity of his crime. It may be said that this argument does not apply to the comparison of one county with another, since, *if* the rural counties formed a homogeneous "population," any one of them might be regarded as a sample of the whole. In the first place, the counties are not homogeneous, and in the second, if they were, it would be best to avoid risk of error by confining the comparison to the aggregate of rural counties on the one hand and urban counties on the other: the course adopted in Table III and Diagram III. In view of the non-homogeneity of the counties, the comparison of individual cases is probably more instructive. It will be found that Professor Pearson in his pamphlet, "The Problem of Practical Eugenics," has also used this method of lines in comparing diagrammatically the changes in the birth-rate during different periods in counties and towns, except that he has employed rates not index numbers, and has not published the constants upon which the lines which appear in his diagrams are based. Had we asserted that our results were applicable to an indefinitely large "population" of counties returning rates over an indefinitely large number of years, then it would have been relevant to point out that constants based upon ten or twenty years' records from a handful of counties were not, unless we could determine something analogous to a "probable error," a sound basis for generalization. Of course, we made no such assertion, and we think Dr. Heron has forgotten the truism that a result which is exact for one purpose is inexact when used for some totally distinct purpose. We wonder why Dr. Heron did not ask himself the reason for our computing "probable errors" in the case of the Swiss material alone. The point was that, in that case, we *did* attempt to generalize our results. We wished to know how far a value obtained from a series of districts which we assumed, very arbitrarily we admit, to be a sample of an indefinitely large "population" of similar districts might be trusted as a general measure of certain associations. In the other cases we had no such object in view, we were not concerned with the experience of London from, say, 1881 to 1900, as a sample of an indefinite number of years, but with the relative changes within that specific period. It appears to us that problems of the present class are essentially problems of graduation. We are given a series of values, a , b , c , d , &c., and the problem is to graduate them; the theory of "probable errors" concerns itself with the totally different problem—viz., how far the series to be graduated, assumed to be exactly observed, adequately represents an experience of which it is a sample. The inquiry presupposes that the series is but a sample of a wider series, and it is difficult in the case of the counties, impossible in that of the whole kingdom, satisfactorily to define such a wider series. To use the ordinary notation of "probable errors" in such a case would be as reasonable as—perhaps less reasonable than—to insist that the expectation of life at a given age assigned by the London Life Table must not be compared with that shown for the same age in the Brighton Life Table, unless the "probable errors" of the values are computed.

We may add that the ordinary method of computing "probable errors."

even in cases where their introduction is appropriate, sometimes, in our opinion, may tempt the reader to neglect other sources of error. This is due to the fact that if we have a series of n rates calculated on populations each of m , the ordinary method of "probable errors" pays attention to n , not to m . Thus, in Dr. Heron's valuable paper on the correlations of the birth-rates in London boroughs with other rates, the "probable errors" of his coefficients are computed on the assumption that the smallest borough yields a rate equally valid as an observation with that derived from the largest. If we only regard such "probable errors," it follows that, e.g., a correlation of 0.5, deduced from a sample of forty cities with populations between 20,000 and 50,000, is more reliable as a basis for generalizations than the same correlation deduced from twenty cities with populations between 100,000 and 200,000, an inference which, in the case of disease rates, may be quite unwarranted. A consciousness of this difficulty makes most observers hesitate to use rates deduced from small absolute numbers,¹ or to include in the same series rates derived from very unequal populations.

Turning to the question of goodness of fit—the effectiveness of the graduation by straight lines—we are perfectly in agreement with the view that some of our lines are but poor fits, although we think that a similar remark applies to certain of the lines upon which Professor Pearson based more definite conclusions than are to be found in our paper. Indeed, we endeavoured to make our opinion clear that the comparison between urban and rural counties did not, on the whole, establish any marked difference in rate of change, hence the negative answer to Dr. Stevenson's hypothetical question.

Passing to the question of index numbers, we think the method adopted to be that which best secures the end in view—viz., the provision of comparable results. It seems to us that the significance of any given increase largely depends upon the relation such increment bears to the average magnitude within the series. This consideration has influenced the very large number of statisticians who employ index numbers for comparative purposes. It is, of course, possible to attain the same end in other ways. Thus Professor Pearson, in the pamphlet already mentioned, while using actual death-rates changed the scale of the diagram when he passed from general to phthisis death-rates. The vertical scale of the diagram, showing the best fitting lines applied to phthisis rates, was ten times as large as that used in the illustration of general death-rates, a device which does not attain the desired

¹ If the population upon which a rate is calculated be regarded as a sample, it is, of course, easy to determine the standard deviation of sampling of the rate or, by an application of Bayes's theorem, to ascertain the probability of two populations with different rates standing one to another in the relation of first and second samples from a common "universe." We cannot, however, by either method, gauge the significance of possible errors in classification which may more seriously vitiate the returns from a small population than those from a large one. Hence, altogether apart from questions of sampling, it is necessary to look with some suspicion upon rates derived from small populations. This was one reason for omitting Wiltshire from one of our comparisons.

end any better than ours. The method of presentation must vary with the particular aspect of the problem it is desired to study; we were interested in relative changes, not absolute differences, used the method appropriate to the treatment of the former, and do not share Dr. Heron's "grave doubt" as to its propriety.

Lastly, we refer to the criticism of our use of rates in terms of persons in one section. Since we provided figures corrected for variations in both the age and sex distributions of the populations under discussion, and only used the figures to try to answer Dr. Stevenson's hypothetical question, the objection seems of little importance. If diagnosis is better in London than in Lincolnshire, it is better in the case of both males and females.

We may add that even when the problem under discussion does seem to require the separation of the sexes, such rates, if uncorrected for age, may lead one further astray than the corrected rate on persons. Thus, in his memoir on the "Relation of Fertility to Social Status" (Dulau and Co.), Dr. Heron writes (p. 12): "We come now to consider the relation between the birth-rate and the prevalence of cancer, and here we get a somewhat unexpected result. Taking both sexes together, we find: Correlation between the birth-rate and death-rate from cancer = -0.563 ± 0.089 ; in other words, the district with a low birth-rate suffers most from cancer." He then proceeds to work out a series of correlations between the cancer rates for males and females and a variety of measures of social status, concluding that there is a significant positive association between the prevalence of cancer and conditions of good social status. Had Dr. Heron simply used the age and sex corrected rates published by the Medical Officer of Health for the County of London, he would, we think, have doubted whether his result might not mainly be due to the more favourable age constitution of the richer districts from the standpoint of cancer incidence. If the corrected rates on persons are used, the correlation shrinks to -0.002 ± 0.132 .¹ A similar reduction is effected if for crude female rates we substitute the age corrected values, Dr. Heron's correlation of -0.535 ± 0.093 becoming -0.177 ± 0.126 . In fact, the neglect of age standardization seems to us a more serious source of error than the use of persons even in such a problem as that dealt with by Dr. Heron. In our own case, for the reasons given, we do not regard the matter as of importance.

Dr. Oertel's remarks were very interesting, particularly his observations on the difficulties of diagnosis, and we are not unmindful of the questions raised by Dr. Farrar in connexion with the results of surgical treatment.

¹ This was obtained after omitting Deptford and Greenwich, which Dr. Heron grouped together, but which are separated in the Medical Officer of Health's table of corrected rates. The value obtained from Dr. Heron's data after omitting the combined district is -0.555 ± 0.092 . The values for corrected rates are quoted from a forthcoming paper by Brown and Lal, who have re-investigated the subject and can find little, if any, correlation between measures of social status and cancer death-rates in the London boroughs, a result in full agreement with the view expressed in the Annual Reports of the Public Health Department.

The difficulty is to obtain trustworthy statistical data as to the effects of operation. This can be well seen in Dr. Lewers's treatise on cancer of the uterus.

We agree with Dr. Dudfield that the time is ripe for a proper utilization of hospital statistics, although, for the reasons adduced by Dr. Bashford, we doubt whether even the most accurate hospital statistics will throw a great deal of light upon the problems discussed in our paper.

Section of Epidemiology and State Medicine.

April 24, 1914.

Dr. W. H. HAMER, President of the Section, in the Chair.

An Outbreak of Food Poisoning caused by the *Bacillus enteritidis* of Gaertner in Milk.

By HAROLD KERR, M.D., and H. J. HUTCHENS, D.S.O.

PART I.—EPIDEMIOLOGY.

ON Saturday morning, November 1, 1913, information was received that about a dozen of the constables and other residents at the East End Police Station, Newcastle-upon-Tyne, had been suddenly affected with severe vomiting, diarrhoea and prostration, accompanied by abdominal pain and high temperature. On inquiry it was found that the first cases occurred late in the evening of Friday, October 31, the others following during the early hours of Saturday morning. The symptoms, together with the circumstances of the outbreak, at once aroused suspicion that the illness was caused by some article of food specifically infected with a bacillus of the group commonly associated with cases of food poisoning. Accordingly the dietary of the sufferers during the preceding forty-eight hours was carefully investigated, when it was found that the only articles of food common to all those affected were water, bread, potatoes and tapioca pudding, which last was eaten, with the addition of a little fresh milk obtained from a local dairy, at the midday meal on Friday. It will be noticed that milk is the only food-stuff of animal origin included in the list, but it was not immediately realized that the epidemic was due to infected milk, partly because

milk has so rarely been incriminated in epidemics of food poisoning, and partly because it was stated at the time that two of the sufferers had used milk from another source only.

Late the same evening (Saturday) a private practitioner notified a number of cases of "ptomaine poisoning" in his practice. Early next morning (Sunday), therefore, all the medical men practising in the affected district were visited or communicated with directly, and from them was obtained a long list of similar cases in some thirty houses. A number of the severer ones were visited, and inquiry as to diet made. These inquiries made it clear that, apart from water, which in all cases came from the general town's supply, milk was the only article of food of which all had partaken, and the source of the milk supplied to the various households was made the subject of close investigation.

A number of the affected persons volunteered the information that the Friday afternoon's milk had had a peculiar taste. The source of the milk was elicited in each affected household, and it was speedily found that it all originated from a single farm in the adjacent district of Longbenton, either directly or through one of several dairies and shops in Heaton, in the eastern half of the city. By the courtesy of the County Medical Officer, the farm was visited about midday on Sunday, and it was found that the farmer himself and two farm hands who were engaged in the milk business were ill, together with two other farm hands living out, but taking meals at the farm. All had drunk some of Friday afternoon's milk, their illness commencing some twelve hours afterwards. The farmer's wife, who had had none of the milk, was unaffected, as also her infant, who, however, was said to have had the raw milk all along.

With regard to the cows, it was ascertained that a batch of five, calved about October 18, had been purchased at Gateshead Mart on Friday, October 24; their milk had been used with that of the other twenty-six cows in the herd, all being mixed together. On Thursday, October 30, the man who had special charge of the cows noticed that one of the five recently acquired animals, a dark roan, was not very well. Next morning, Friday, she was rather worse, and her milk had diminished to about one-third of its usual quantity, which latter was given as "a bucket and a half." At the afternoon milking this cow seemed really ill, and thinking a "cold" was the trouble, since he could perceive no special symptoms, the milkman administered a dose of a patent medicine, the analysis of which is given below. Her milk yield amounted to about a pint only, and though it was described as

being "rather thick, like strippings," it was nevertheless mixed as usual with that of the rest of the herd. Next morning, early, the cow was found dead in her stall.

Several persons usually took part in the milking, and no special precautions as to cleanliness were adopted. Each milker took so many cows, using one bucket all the time; as each cow was milked the bucket was emptied into a large vessel before the milker proceeded to the next animal. The mixed milk was then placed in "churns," and sent off direct by cart to the various customers in Newcastle and district, the total daily yield being about 80 gallons. The cow-byres and dairy were built round a "fold yard," full of manure and liquid filth. There was no evidence of any cooling apparatus.

The carcase of the cow was removed to a knacker's yard in Newcastle on Saturday, November 1, the day of the animal's death, and before the origin of the epidemic had been traced. Here it was found, already in a state of partial decomposition, on Sunday afternoon. The spleen, udder, uterus, portions of intestines and mesenteric glands were taken for examination.

An endeavour was made to trace the origin and recent history of the cow which appeared to be the source of trouble, but unsuccessfully. The animal, as stated above, was purchased on Friday, October 24, at Gateshead Auction Mart, from a Ponteland farmer, who in turn had bought her at Darlington Market on the Monday previous, October 20. The latter is a big market, and no record is kept of the origin of cows brought for sale, and consequently nothing further could be ascertained about the animal. It was not known whether she had aborted, or calved in the usual way.

A couple of years ago two cows in the herd in Longbenton aborted, and were promptly sent for slaughter, and about two months before the outbreak under discussion one cow went slightly off her food, and her milk yield diminished, but she was quite well again in a day or two. No other cases of illness were known to have occurred recently amongst the cows and other animals on the farm, or among the human inhabitants.

No rat virus of any description has ever been used on the farm—as a matter of fact rats are almost unknown there.

During the progress of the investigation the farmer was made to carry out thorough cleansing and disinfection of the cowshed where the affected animal had been housed. For this the County and District Medical Officers of Health were responsible, and they supervised the

proceedings. The bedding and litter were removed from the byre and burnt just outside it; the byre was then thoroughly cleansed, disinfected, and hot lime-washed. All dairy utensils were well scalded, and the dairy cleansed. All the persons who had worked among the cows or handled the milk, and all who had suffered in any way from gastrointestinal symptoms, were forbidden to have anything whatever to do with the cows or the milk for a full week, when they were again permitted to resume their usual employment.

Except that on one day during the week the farmer himself delivered milk, owing to misunderstanding, all instructions appear to have been executed.

Customers.—A complete list was obtained from the farmer of all his milk customers. These included two dairies in Heaton, part only of whose supply came from this farm, and one or two small general shops; the two dairies also supplied one or two small shops, all of these in Heaton. Lists of the customers of the dairies and small shops were also obtained. The following is a summary:—

Houses supplied direct from the farm	...	...	...	...	185
Houses supplied with the farm's milk through the two dairies	...	...	...	...	172
Houses supplied with the farm's milk through smaller shops	...	...	...	...	15
Houses supplied with the farm's milk indirectly from the dairies through smaller shops	...	...	...	...	40
Total					412

In addition there was an unknown number of persons who purchased small quantities of milk in the various shops. These must have included one or two unknown hawkers, who peddled the milk in the back lanes, as a number of affected persons stated that their milk was so obtained.

The farmer's list also included one house in the Gosforth and six in the Longbenton areas.

Persons supplied with the Milk.—(a) *In Newcastle:* Five members of the inspectorial staff of the Health Department were detailed on the Monday morning, November 3, to visit every known customer of the farm, direct or indirect, together with such other households as had been reported by medical practitioners to be affected, and any others of whom they might hear casually. Inquiries were made in each case as to the number of persons in the house, the number affected, and the persons who had consumed milk, and any other foodstuff upon which

suspicion might rest. It was not found possible to obtain reliable information as to the exact persons who had used the milk, beyond that the source of the domestic supply was verified, and in practically every instance the sufferers remembered that they at least had had some of the milk. The result of this special inquiry among the Newcastle customers was as follows:—

Total number of houses visited	...	...	...	...	429
Number of houses in which affected persons were found	..	...	...	...	232
Total occupants of affected houses	...	...	...	...	996
Total persons stated to have been affected	...	...	...	...	511
Houses supplied with farm's milk, but found to be unaffected	...	...	...	...	78
Affected houses found to have obtained their milk from unknown hawkers	...	...	...	...	4

The private dining rooms for the employés of a local engineering works were supplied by one of the dairies which sells milk from the farm in question, amongst that from other sources, but it is doubtful whether this contained any of that from the special farm. Forty persons dine here daily, and none complained of any ill-effects. All the cases of illness occurred, so far as could be ascertained, on the Friday night, Saturday, or Sunday morning (October 31 and November 1 and 2). One case was reported on the Wednesday (November 5) as having occurred the previous day, the history being that Yorkshire pudding had been made on the Saturday with some of the Friday's milk. This was not eaten till Monday evening or Tuesday, and the illness commenced some hours after.

(b) *Outside Newcastle.*—In addition to the Newcastle users of the farm's milk, a number of others, resident in outside areas, was obtained. The inquiry among these was made at the instance of the County Medical Officer of Health, who has been good enough to supply the following particulars:—

Houses visited (including the farm)	...	...	...	...	10
Number in which affected persons were found	...	...	...	...	5
Total occupants of affected houses	...	...	...	...	19
Total persons stated to have been affected	...	...	...	...	12
Houses supplied with the farm's milk, but found to be unaffected	...	...	...	...	5

In one house, in which three out of four people were taken ill, only morning milk was said to have been obtained.

(c) *Total*.—The total households and persons, in and around the city, involved in the epidemic were therefore :—

Total houses ascertained by the inquiry to have been supplied with milk from the farm	...	...	...	...	...	...	320
Number of houses in which affected persons were found	...	...	...	...	...	...	237
Total occupants of affected houses	...	...	...	...	...	...	1,015
Total persons stated to have been affected	...	...	...	...	...	...	523
Houses supplied with farm's milk, but found to be unaffected	...	...	...	...	...	...	83
Affected houses found to have obtained their milk from unknown hawkers	...	...	...	...	...	...	4

This completes the list so far as it has been possible to ascertain. Most fortunately there were no deaths among the persons thus affected, although many were seriously ill.

(d) *Animals affected*.—In two cases a dog, and in another a cat, were given some of the farm's milk, and in all three instances the animal was stated to have suffered subsequently from severe diarrhoea and vomiting.

(e) *Unaffected Households*.—Of the houses supplied with the farm's milk in which nobody was affected, in most instances the milk was only used cooked in food—e.g., puddings—or was boiled before consumption. In a few houses (exact number unknown) the milk was stated to have been used in the ordinary way, part of it presumably raw, without ill-effect. It is not quite certain whether the milk in these cases was always from the special farm, or from some of the others supplying the local dairies. Of the five households outside Newcastle which obtained the farm's milk but were unaffected, it appeared that three obtained only a small quantity of morning milk daily, one obtained one pint morning and evening, and the remaining one got "two pennyworth" per day, presumably from morning and evening supply. In one household, where a boy, aged 12, was taken ill, his mother, a consumptive, drank a quart of raw milk (from the farm) each day, but was unaffected. The farmer's own infant, who alone of all those on the farm partook of the raw milk without any untoward consequences, was said to have been getting the mixed milk of the herd throughout.

In no instance was a person who had used only boiled milk known to have been affected. Thus, in one family, consisting of husband, wife and wife's mother, the two women drank a small quantity of raw milk from the farm, at the most a tumblerful, and both were taken ill about twelve hours later. The husband, on the other hand, habitually drank

a pint a day, but always boiled. He followed his usual custom on this occasion, and was unaffected.

Incubation.—It was not found practicable to ascertain the period that elapsed between ingestion of the milk and the appearance of symptoms in all cases, but this point was investigated in fifty-five instances, and the analysis of these is as follows:—

Incubation in hours		Number of cases		Milk consumed				
				Raw	Over pudding or porridge		In tea or cocoa	
4	...	4	...	4	...	—	...	—
5	...	2	...	1	...	1	...	—
8	...	1	...	1	...	—	...	—
9	...	2	...	2	...	—	...	—
11½	...	3	...	1	...	1	...	1
12	...	8	...	3	...	3	..	2
13	...	7	...	3	...	4	...	—
14	...	2	...	2	..	—	...	—
15	...	3	...	2	...	1	...	—
15½	...	1	...	1	...	—	...	—
16	...	1	...	1	...	—	...	—
18	...	2	...	1	...	1	...	—
18½	...	3	...	—	..	3	...	—
20	...	1	...	—	...	1	...	—
21	...	1	...	—	...	—	...	1
22½	...	1	...	1	...	—	...	—
23	...	1	...	—	...	—	...	1
24	...	3	...	1	...	2	...	—
28	...	1	...	—	...	1	...	—
29	...	1	...	—	...	1	...	—
32	...	2	...	2	...	—	...	—
36	...	1	...	—	...	—	...	1
36½	...	3	...	1	...	1	...	1
39	...	1	...	1	..	—	...	—
(infant of 18 months)								
4 to 39 hours	...	55	...	28	...	20	...	7

From the foregoing it will be noted that of the fifty-five cases thirty-six had an incubation of not more than eighteen hours, and of these twenty-two appeared to have drunk raw cold milk, the other fourteen having taken the milk over pudding or porridge, or in tea or cocoa, and presumably in smaller quantity than the former. Nineteen of the fifty-five had incubation periods of more than eighteen hours, and of these only six drank raw cold milk, while thirteen took their milk over pudding or in tea. This appears to afford *prima facie* evidence that the length of the incubation period was to a large extent dependent upon the dosage of the causative material. Unfortunately it was not

practicable to obtain exact data on the point, but speaking generally, the severity of the attacks seems to have been in proportion to the quantity of the milk consumed. In no case was the consumer of only boiled or cooked milk known to have been affected. The last case on the above table, that with the long incubation period of thirty-nine hours, was a baby of 18 months. As noted above, at the farm itself an infant of younger age than this was not ill at all, although stated to have been drinking the raw mixed milk of the herd all along.

Analysis of Medicine. — A bottle of medicine, similar to that administered to the cow on the last day upon which it was milked, was obtained and submitted to the City Analyst, Dr. J. T. Dunn. His Report is as follows: "The sample contains cloves, possibly also ginger, alcohol and potassium nitrate. It has a faint smell of ethyl nitrite, but the quantity contained is so small as not to be measurable. The potassium nitrate amounts to about 1·5 per cent. of the whole, and the solid residue of the cloves and ginger, after evaporating the water and alcohol, is approximately 0·75 per cent. I can detect no harmful ingredients in the sample."

PART II.—BACTERIOLOGY.

On November '3, 1913, the following materials were submitted to bacteriological examination:—

(A) *From a cow.*

(1) A loop of the intestine.

(2) The spleen.

(3) The uterus.

(4) The mesentery and mesenteric glands.

(5) A few cubic centimetres of a blood-stained milky fluid collected from the udder with a sterile pipette after the udder had been cut across. (None of the milk which had been sold could be obtained, and the only means of examining the milk was to cut into the udder and collect a few drops as above.)

(B) *Stools of seven of the patients affected.*

Seeing that the illness was probably due to one or other of the members of the Salmonella group of micro-organisms the investigations were mainly directed to the detection of organisms of that group. An emulsion in sterile water was prepared with each of the different materials, and the twelve emulsions were used as follows:—

(a) Plates were prepared on MacConkey's lactose agar with the emulsions from the cow.

(b) Brilliant green peptone water¹ was sown with all the emulsions, and, after incubating for twenty-four hours, loopfuls were plated on lactose agar.

(c) Dulcitate peptone water was similarly sown with all the emulsions and, after incubation, plated as in the preceding case.

On these various plates non-lactose-fermenting organisms were readily recognized, and several from each plate were sub-cultivated in litmus milk. The great majority of the milk tubes became alkaline, and one from each source (twelve in all) was selected for further examination. All the organisms thus isolated possessed the same characteristics and gave the same reactions:—

On agar the growth was rapid and luxuriant and bluish in colour, and on microscopical examination was found to consist of Gram-negative, highly motile, cocco-bacilli.

On gelatine the organisms grew rapidly and luxuriantly without liquefying the medium (ten days).

In litmus milk some degree of acidity was developed in the first twenty-four to forty-eight hours at 37° C., but the medium subsequently became distinctly alkaline.

In peptone water no indol was present after ten days' incubation at 37° C. when tested with paradimethylamidobenzaldehyde.

Both acid and gas were produced from glucose, dulcitate, and mannite, but neither acid nor gas was formed out of either lactose or saccharose.

The organisms isolated had, therefore, all the characteristics of the *Salmonella* group, and it remained to be determined with which member of the group they were identical. For this purpose a series of agglutination tests was carried out with two strains of the organism, one from the milk and one from the stools of one of the affected persons. The results are shown in the table (*see* p. 180).

These experiments show that the organisms examined are identical with Gaertner's bacillus.

¹ Browning, Gilmour, and Mackie, *Journ. of Hygiene*, 1913, xii, p. 335.

TABLE.—AGGLUTINATION REACTIONS OF THE ORGANISM ISOLATED WITH KNOWN SPECIFIC SERUMS.

	DILUTIONS OF SERUM										Saline
	20	100	200	400	800	1,600	3,200	6,400	12,800	25,600	
(1) <i>Using a Gaertner serum</i> :—											
Organism from the milk	+++	+++	+++	+++	+++	+++	+	o	o	o	o
Organism from stool No. 5	+++	+++	+++	+++	+++	+++	o	o	o	o	o
Controls :—											
Gaertner (Newcastle No. 1)	+++	+++	+++	+++	+++	+++	+++	+	o	o	o
Liverpool rat virus	+++	+++	+++	+++	+++	+++	+	o	o	o	o
(2) <i>Using an Aertrycke serum</i> :—											
Organism from the milk	o	o	o	o	o	o	o	o	o	o	o
Organism from stool No. 5	o	o	o	o	o	o	o	o	o	o	o
Controls :—											
Aertrycke (Král)	+++	+++	+++	+++	+++	+++	+++	o	o	o	o
Aertrycke (Newcastle)	+++	+++	+++	+++	+++	+++	o	o	o	o	o
Paratyphoid B (McWeeney)	+++	+++	+++	+++	+++	+++	+	+	+	+	o
(3) <i>Using a paratyphoid B serum</i> :—											
Organism from the milk	o	o	o	o	o	o	o	o	o	o	o
Organism from stool No. 5	o	o	o	o	o	o	o	o	o	o	o
Control :—											
Paratyphoid B (McWeeney)	+++	+++	+++	+++	+++	+++	+++	+	+	+	o

NOTE.—The degree of agglutination is indicated by the number of + signs.

PART III.—SUMMARY AND CONCLUSIONS.

Summary.

From the foregoing it is seen that an outbreak of illness, characterized by severe gastro-intestinal disturbance and collapse, and affecting at least 523 persons, occurred in Newcastle-upon-Tyne on the night of October 31—November 1, a few cases being reported within the subsequent thirty-six hours.

Like other outbreaks of food poisoning, the one under report was of exceedingly sudden, almost fulminating, onset, and on cessation of use of the causative material as suddenly stopped.

The incubation periods of the infection varied from about four to thirty-nine hours, the majority being less than eighteen hours.

All the cases were in households supplied directly or indirectly with milk from one particular farm.

At this farm—where five cases of the illness had occurred—it was found that one of the cows, recently calved and added to the herd, had shown signs of illness a day or two before, and died almost coincidently with the occurrence of the first cases of the outbreak, and that her milk was mixed with the general yield of the herd right up to the last.

From the spleen, mesenteric glands, uterus and intestine of the cow, from milk obtained from the udder after death, and from the stools of seven of the persons affected, an organism was obtained identical morphologically, bio-chemically, and serologically with that originally isolated by Gaertner from an outbreak of food poisoning at Frankenhäusen in 1888, and commonly known as the *Bacillus enteritidis* of Gaertner.

No article of food other than milk was common to the dietaries of all the sufferers, with the exception of water from the town's supply, which, obviously for many and apparent reasons, took no part in the causation of the epidemic.

It is clear that the illness must be attributed to an infection with Gaertner's bacillus derived from the milk of a cow which was suffering from and died of a Gaertner septicæmia following parturition. Unfortunately this epidemic has shed no light upon the source whence the cow became infected—a subject upon which information is much needed.

Conclusions.

An epidemic of food poisoning affecting at least 523 persons and three domestic animals, all of whom recovered, is described and shown to have been due to the infection of a particular milk supply with Gaertner's bacillus derived from the milk of one of the cows which had recently calved, and ultimately died of a Gaertner septicæmia almost coincidently with the appearance of the epidemic.

We beg to tender our thanks and to acknowledge our indebtedness for much help given us by a number of medical men, and especially by Dr. J. W. Hembrough, Medical Officer of Health of the County of Northumberland, and by our Assistants, Dr. S. J. Clegg, Assistant Medical Officer of Health, and Dr. W. J. Tulloch, of the College of Medicine.

DISCUSSION.

Dr. G. S. BUCHANAN said that the paper was particularly interesting on the veterinary side, and he had been asked by Sir John McFadyean to express his great regret at being prevented from attending. They were, however, glad to see Mr. Sheather of the Pathological Department of the Royal Veterinary College that evening. Sir Stewart Stockman, of the Board of Agriculture, had also written expressing his great interest in the paper. With regard to post-mortem findings from the cow, Sir Stewart Stockman referred to his experience that the organs become invaded by intestinal bacteria at a very rapid rate, often within a few hours, after death, and these bacteria may include many which are pathogenic by inoculation. Dr. Buchanan might refer also to a comment by Dr. Savage that it would have been instructive if serum tests had been carried out upon the one or more infants and other persons said to have drunk unboiled milk, and to have been unaffected. These cases might on such tests have shown that some slight infection had occurred. From some considerable experience of local investigations into outbreaks of food poisoning Dr. Buchanan was able unreservedly to congratulate the authors on the promptness and thoroughness with which the whole investigation had been undertaken. If such investigations were the rule he was confident that our knowledge of the causation of food poisoning would soon be much further advanced than it is at present. The alleged complete immunity of those who had consumed only boiled milk needed some consideration. The toxins of Gaertner bacilli are notoriously resistant to heat, and one would have expected that boiled milk would have produced some symptoms of poisoning, although not of the severer type which would be occasioned by the living bacilli themselves. It would be well to be fully satisfied that this immunity was a real one. Unless special care was taken in the inquiries it would be easy to overlook slighter cases of poisoning due to the boiled milk, particularly if, on hearing that the milk was boiled, the investigator did not press his questions further. Moreover, the specific instances given in which the drinkers of boiled milk escaped were few, and had to be considered along with the other specific cases in which the raw milk was taken without ill-effects. Assuming, however, that there was in fact a real and complete immunity of the boiled milk drinkers, the explanation would perhaps be that the actual dose of Gaertner bacilli in the milk was comparatively small, that the illness resulted from its multiplication after the milk had been swallowed, and that the virulence of the organism was considerable. The absence of any fatal case was not inconsistent with this view. As to the condition of the cow, it was interesting to find that in this case the Gaertner infection had been traced back to animal disease, as Dr. H. E. Durham used to insist in his pioneer work on the subject many years ago. Gaertner infection of the cow did not appear to have been frequently recorded. Dr. Savage, on p. 32 of his report to the Local Government Board on Bacterial Food Poisoning and Food Infections, 1913, gave one interesting case reported

by Mohler and Buckley. It seemed possible that it might be relatively not an uncommon event in newly calved cows, but seldom of sufficient intensity to cause excretion of Gaertner bacilli by means of the milk. If lesser degrees of Gaertner infection of the cow did occur, the absence of evidence of human illness due to such an infection was perhaps to be attributed to the dosage of infection in the milk being too small to cause any outbreak which would attract attention. In the present case it would seem that the cow was milked even when she was so ill that the milk supply had shrunk to a third of its usual quantity, and milking was continued even when the yield was only about 1 pint of thick and abnormal-looking milk. In the hands of an ordinarily intelligent and conscientious cowman milk of this kind would surely be rejected. The question whether the milk was merely infected by way of excreta or whether the bacilli were actually eliminated in the milk did not seem to be settled in this case beyond doubt, as unfortunately the cow was dead before the bacteriologist reached it. The trend of the evidence, however, and analogy with other diseases, suggested that the bacteria were actually excreted in the milk. He understood that Professor Hutchens could tell the Section of another investigation in which the milk causing the illness was traced back to a cow from whose milk sinuses Gaertner bacilli were recovered.

Professor S. DELÉPINE sent the following communication: In the first instance I wish to congratulate the authors upon the valuable contribution they have made to the knowledge of the question they have so ably dealt with. The outbreak is of special interest, because the history as well as the examination of the cow seem to indicate clearly that the source of the infection of the milk was a cow dying of septicæmia due to the *Bacillus enteritidis* of Gaertner. This bacillus is certainly capable of causing a fatal septicæmia. I have had the opportunity of examining the carcass of a cow in which a very virulent strain of this organism could be isolated from all the organs and excreta, but I have never had the occasion of observing an outbreak which could certainly be attributed to the passage of the bacillus into the milk through the udder during the life of a cow. In 1894 I assisted Dr. Niven in the investigation of an outbreak of food poisoning due to the consumption of milk, which occurred in Manchester, and which resembled in many respects the one described by the authors, but in which the source of infection remained obscure. On the night of November 5, and early part of November 6, some 160 persons belonging to forty-seven families were attacked with diarrhœa, sickness and abdominal pains (a few cases occurred on November 4 and on November 7; that is to say, one day earlier and one day later than in the bulk of the cases). In this outbreak also no deaths occurred. It was ascertained that all the patients had obtained milk from one farm on which thirteen cows were kept, and that one of these cows was affected with "garget"—i.e., a form of mastitis. This last cow was sent away from the farm on November 8, and slaughtered on November 10; the removal of this cow was probably due to the fact that one of the medical men attending some of the cases had visited the farm to ascertain whether there was any

disease among the cows. When this came to our knowledge the cow had already been destroyed, and was not available for investigation. The farm itself was in a very insanitary condition, freely exposed to the dust of about 40,000 tons of refuse, which had been deposited in its neighbourhood; it was partly encompassed by two polluted streams. The cows were watered at a pool receiving drainage from the cowshed midden. The water used to wash the vessels was obtained from a foul cistern. Previous to these facts having been ascertained, some of the milk which had produced illness had been examined by me, and found to contain a very considerable number of bacteria, of which seven kinds were specially investigated, one streptococcus which was abundant, three bacilli, which were also numerous, and which I recorded then as belonging to the *Bacillus coli* group (at that time I used to describe the *Bacillus coli communis* and the *Bacillus typhosus* as the two extreme types of the *Bacillus coli* group). The other organisms investigated liquefied gelatine, and proved of no importance. Of the organisms which belonged to my colon group, one was a typical *Bacillus coli communis*, which caused local abscesses in animals inoculated with it, but which was otherwise of low virulence. The other two bacilli did not coagulate milk, or produce acid, but they fermented glucose; their growth on potato and on gelatine resembled that of the *Bacillus typhosus*. They were actively motile, and highly pathogenic to guinea-pigs, in which they produced a rapidly fatal septicæmia. At that time I had not the means of comparing these bacilli with Gaertner's bacillus, but subsequent experience left me no doubt as their belonging to the same group as the bacillus originally described by Gaertner. Dr. Niven was of opinion that the outbreak was due to the consumption of the milk from the cow affected with mastitis, which unfortunately we never had the opportunity of investigating. I was, on the other hand, inclined to consider that the evidence at our disposal proved only faecal infection, possibly due to the presence of some infected animal or person at the farm. My reasons for attributing the infectiousness of the milk to faecal pollution were: that the milk contained only a small number of cells,¹ that several kinds of faecal bacteria were present in it, and that their number indicated that these bacteria had been allowed to multiply in the fluid which had become particularly dangerous owing to this multiplication. Dr. Kerr and Dr. Hutchens have been more fortunate than we were in Manchester as regards the part of the investigation relating to the cow. Their cow was undoubtedly capable of infecting a large amount of milk: the remarkable thing is that the period during which it acted in this way was so short. This might be explained by supposing that the infection remained local up to thirty-six or forty-eight hours before the death of the animal, and that after the onset of a fatal septicæmia the bacilli were freely excreted by the udder. This, however, does not solve the difficulty entirely, for as the septicæmia advanced the milk produced by the cow diminished rapidly, until at the last milking the cow yielded only 1 pint; at the previous milking the cow had yielded only

¹ The milk from cows affected with mastitis usually contains a large number of cells.

one-third of her normal quantity. It was on the Friday that this reduction was observed. This would seem to have been on the same day on which the outbreak began. Now the average yield of the herd of thirty-one cows (including the diseased one) is stated to have been 30 gallons, and on the date on which the milk was specially infectious the diseased cow in all probability did not yield more than half a gallon—i.e., one one-sixtieth part of the milk supplied to a number of persons of whom some 523 became ill. Most of these persons must have consumed less than 1 pint of milk, and many not more than $\frac{1}{2}$ pint. If we suppose that the diseased milk was equally distributed, the persons affected cannot have consumed more than from one-sixteenth to one-eighth of an ounce of the milk of the diseased cow. Judging by the quantity of Gaertner bacilli which I have found necessary to produce infection by experimental ingestion I doubt whether the above-mentioned amount would have proved sufficient to infect more than a few specially liable persons if only the number of bacilli originally in the milk at the time of milking had been ingested. I think that in order to account for the proportions that this outbreak reached it must be assumed that multiplication of bacilli must have taken place after milking and before distribution to the consumer. This multiplication I have shown to be extraordinarily rapid in the case of *Bacillus enteritidis* when the milk is not cooled soon after milking. It must also be kept in mind that not more than one-half or one-third of the cans in which milkers emptied their buckets at the time of milking must have contained an appreciable amount of the diseased cow's milk. The milk in the other cans must have been infected by the milkers, utensils, strainers, &c., that had come in contact with the diseased milk or excreta of the diseased animal (some of the milk may have been infected by splashings), and it can only be owing to the opportunity which a comparatively small number of bacteria so introduced had to multiply that the infection of the milk became sufficiently massive to produce an outbreak of the magnitude of that described by the authors.

MR. A. LESLIE SHEATHER: From my point of view the principal interest attaches to the question of the infection of the cow with Gaertner's bacillus. The history of the outbreak very strongly suggests that the cow actually was the subject of a septicæmic condition due to this bacillus. It is possible, however, that the infection was neither the primary disease nor the cause of death. That organisms of the paratyphoid group may gain access to the blood and tissues of an animal as secondary invaders is abundantly shown in the case of swine fever. The cause of this disease is an ultravisible virus, but in a large proportion of cases a bacillus of the paratyphoid group can be isolated from the mesenteric glands and the blood of diseased pigs. This organism is a normal inhabitant of the intestine of the pig and is responsible for the lesions observed in cases of swine fever. These lesions can be reproduced experimentally by feeding pigs with cultures of the bacillus. As to the manner in which the cow acquired the infection, there is a probability that the uterus was the seat of the primary multiplication of the bacillus. Gaertner's bacillus

is known to be capable of maintaining its existence as a saprophyte in the outer world, and therefore it is quite reasonable to suppose that the infection gained access to the uterus at or shortly after parturition. That disease of the uterus consequent upon parturition plays a considerable part in the causation of meat poisoning is indicated by the fact that in nine out of forty outbreaks mentioned by Ostertag the meat responsible for the outbreak had been derived from animals killed in consequence of illness following parturition. The proportion is possibly even higher, as the reason for slaughter is not mentioned in every instance. There is some evidence to show that animals may be infected with Gaertner's bacillus without showing any symptoms of illness. In 1911 Winzer recorded the results of examinations which he made of apparently healthy calves killed in slaughterhouses. The spleen and some of the body lymphatic glands were examined immediately after slaughter, and Gaertner's bacillus was isolated from eight out of thirty animals. The author states that his examinations of adult cattle were all negative, but gives no details as to the number of animals examined.

Dr. A. R. LITTELJOHN: I am afraid I have very few comments to make on Dr. Kerr's paper, partly owing to the complete and concise manner in which he has dealt with the subject, and partly because the few points for discussion which I had succeeded in unearthing have already been touched upon by previous speakers. In the first place, there can be no reason for doubting that the milk of the diseased cow was the cause of the outbreak, and seeing that the cow in question had calved about twelve days previously, we may be justified in considering her illness and death as the probable result of this act. There is just one link missing in this chain of evidence against the cow, which would have been welcomed, and that is the evidence that the organism responsible for this food poisoning outbreak was present in the cow's milk during her life. Unfortunately, when the cow was traced she had already been dead two days, and sceptics may say that the organism found in the udder had spread there after death. But for general purposes the evidence brought before us to-night is sufficient to show what disastrous results may arise from drinking the milk of a recently calved cow, should that cow develop a septic infection of the uterus. With the President's permission I will now read for Dr. MacFadden, who is unfortunately prevented from coming this evening, an account of a case of meat food poisoning which presents some exceptional features, and for which organisms of the Gaertner group were responsible.

Dr. MACFADDEN: I am glad of this opportunity to bring before the Section an account of an outbreak of bacterial food poisoning of special interest which has recently been reported to the Local Government Board. The cases occurred at Skelmanthorp in February of this year, and were the subject of inquiry by my colleague, Dr. Hancock. The following are the points in the history of the occurrence: Only one family was affected. It consisted of the father (who died), mother, three daughters, and three sons.

The food in question was canned corned beef, the product of an Australian packing house. On Saturday, February 14, at 12 noon, the mother purchased at a small general village shop in the neighbourhood 1 lb. of this corned beef. This pound of beef was made up (a) of a portion which remained of the contents of a 6-lb. can which had been opened the day before and turned out on a wooden platter on the counter, and (b) a portion of a new 6-lb. can which was opened at the time of sale in order to make up the amount required. The two slabs of meat were placed one on top of the other, and were taken home and consumed by all the members of the family within half an hour of the purchase. Six out of the eight members of the family were subsequently taken ill. The two boys who escaped were the first to be served, and they received between them the portion of meat which had been taken from the newly opened can. Inquiries failed to discover the occurrence of any illness among the other persons in the village who had consumed meat from the can which was opened on the Friday. It was clear that, with one possible exception, the first 5 lb. of the meat had been purchased and removed from the shop on the Friday, the same day on which the can was opened. The possible exception referred to was that of a nephew of the shopkeeper, who was said to have been given a portion of the meat from this can for breakfast on the Saturday morning; he remained well. It will be seen, therefore, that, with this possible exception, the meat which had been kept overnight turned out of its can on the shop counter and protected only (as was ascertained) by a paper covering, had acquired the new property of producing illness (ending fatally in one case) in all who consumed it. The nature of the illness pointed to infection by living organisms. There was an incubation period, varying between thirty-two hours and five days, before the usual acute symptoms developed. The cases varied considerably in their severity. The notes on them are as follows: The father, mother, and youngest daughter, Mary (aged 7) had incubation periods of from thirty-two to thirty-four hours. The illness of the youngest daughter was very severe. Thirty-two hours after eating the suspected meat she complained of dizziness, headache, and weakness in the limbs. These symptoms were followed by vomiting, diarrhoea, and abdominal cramps on February 17, three days after onset, when the doctor was first called in. She then had a temperature of 102° F., was restless, and semi-conscious. Cerebral symptoms developed on the following day, when she had convulsions followed by coma, in which condition she is said to have remained until February 22. From that day she began to mend. The onset of the father's illness, which ended fatally, began thirty-four hours after eating the meat. His symptoms appear to have begun with diarrhoea, vomiting, and abdominal cramp, and to have progressed until death, which took place five days later. He is said to have shown no cerebral symptoms, his temperature was sub-normal throughout, he remained conscious to the end, and died apparently of exhaustion. The mother's symptoms were similar, but less intense, and she was sufficiently well to attend to her household duties six days after the onset. The illness of the son who was affected was apparently slight. He is said to

have been out of sorts for a day or two, but was never sufficiently ill to lay up. The daughter Ellen (aged 19), after having partaken of Saturday's mid-day meal, left home and stayed Saturday night and all Sunday with friends in the neighbourhood. She returned home on Sunday night feeling somewhat out of sorts, and slept badly. During Monday and Tuesday, February 16 and 17, she complained of giddiness, muscular pains, and a feeling of fullness in the mouth (her "tongue felt too large"). She, however, performed certain household duties and helped to nurse her parents and sister Mary. It was not until Wednesday, February 18, four days after eating the meat, that she was definitely ill. On that morning she had a bad shivering attack, followed soon after by vomiting, diarrhoea, and abdominal pains. On February 19 she was very ill, her condition simulating that of her sister Mary. On February 21 she was removed to the Huddersfield Infirmary, where she ultimately recovered. Her sister Beatrice, aged 21, remained well until Thursday, February 19, five days after eating the suspected meat. On that day she complained of weakness of the legs, muscular pain, and swollen tongue. She vomited once or twice, but her temperature remained normal throughout. She soon completely recovered. Post-mortem material from the fatal case was examined bacteriologically by Dr. Sutherland. His full report is not yet available, but I understand that a bacillus belonging to the Gaertner-paratyphoid group was isolated from the spleen and other organs.

These cases possess points of special interest of their own—e.g., the wide range in severity of symptoms, and the exceptionally prolonged incubation period noted in the cases of the two daughters Ellen and Beatrice. But I wish more especially to draw attention at the moment to their bearing on the general question of bacterial food poisoning through the medium of canned meats. It is an important practical question, as canned meats form a large and increasing item in the country's food supply, and investigation of many cases of food poisoning attributed to their use has, often for unavoidable reasons, left it uncertain as to whether infection of the meat had occurred before or after the receptacle was opened. A number of cases have been reported in which there was little doubt on this point. Such were the cases which occurred at Partick in 1906, and at St. Helens, Gateshead, Carlisle, and Hassle in 1910. All these outbreaks were shown to have resulted from eating canned meat, which, however, was not found to contain any living bacteria capable of accounting for the illness. In all the persons affected in these outbreaks acute symptoms began within a few hours—generally two or three—of eating the meat, which pointed to a ready-made toxin as being the cause rather than to a living organism. In the Partick cases a positive serological test with Gaertner's bacillus was obtained in all the cases examined. The conclusions arrived at in regard to these cases were that the meat had been infected with Gaertner's bacillus before canning, and that in the process of sterilization the organisms had been killed, leaving their toxins (which are known to be highly resistant to heat) intact in the bodies of the dead organisms contained in the meat. It should be fairly easy to distinguish outbreaks of this

kind, and to satisfy oneself that, whether the meat had become infective owing to disease in the animal during life or from contamination with infective material during the process of preparation, the disease-producing properties were present in the contents of the can before it was opened. Where, however, illness, resulting from consumption of canned meats, runs a course suggestive of infection with a living organism, it will seldom be easy to obtain evidence as to whether the meat was infective before the can was opened or had been rendered so after opening. The outbreak of which I have given some details comes, I think, into the latter category. Although inquiry failed to discover any more definite explanation of the means whereby the meat had become contaminated (other than that it had been left exposed on a shop counter all night where rats and mice could have had access to it) the fact that the bulk of the contents of the can was consumed without harm by a number of persons on one day and gave rise to infection with a living organism in those who ate it the following day, points, I think, very strongly to the meat having been contaminated in some way with the Gaertner organism in the shop after the can had been opened. I cannot recall a case of food poisoning associated with canned meat in which there was definite evidence pointing to a living Gaertner organism having been present in the can before it was opened. It is, moreover, difficult to imagine the circumstances in which organisms with so low a thermal death-point as those of the Gaertner group could survive any process of "sterilization" which would not also allow of the survival of innumerable putrefactive organisms which would speedily render the meat uneatable. It seems to me more likely, where canned meats have given rise to illness which is obviously due to the action of a living organism, that contamination of the meat occurred after the can had been opened, and in investigating such outbreaks it would, I think, be well to concentrate on the possible sources of infection in the shop or in the home of the consumer. Investigation in this direction might possibly be productive of some fresh evidence, which is badly needed, as to the various means by which Gaertner infection is conveyed. In his report to the Local Government Board on food poisoning, Dr. Savage made special reference to the part which may be played by rats and mice in contaminating foods. Dr. Savage has shown that rats and mice are frequent "carriers" of organisms of the Gaertner group, and his suggestions on this point are, I think, well worth bearing in mind in investigating cases of this kind.

Dr. J. E. SANDILANDS referred to the authors' statement that milk had so rarely been incriminated in epidemics of food poisoning, to the absence of any reference to milk in text-book accounts of so-called ptomaine poisoning, and to the fact that in the summary by Dr. Savage of seventy-nine British outbreaks of food poisoning, milk was only incriminated in three instances. In these circumstances Dr. Sandilands hoped he would not be wasting the time of the Section in describing a case of poisoning by milk which occurred in Kensington on July 3, 1913, in a household consisting of seven persons—the husband, wife, and baby aged 1 year, two nurses and two other servants. The husband took

no meal in the house, except breakfast, and escaped. The baby had a separate supply of milk, and escaped. With these two exceptions the food in the house was consumed in common by the other members of the household, and included roast mutton, junket, and stewed plums. Of these five other members of the household two escaped—namely, the two nurses—and three, namely the wife, cook and housemaid, were attacked. The two servants attacked ate the mutton cold in the evening, but the mutton was also eaten cold by a nurse, who escaped, and was not eaten cold by the wife, who dined out with her husband. The suspected milk was delivered at 3 p.m., and boiled in a copper saucepan, according to the statement of the housemaid. The two nurses took a small quantity only in tea at 5 p.m., and did not fall ill. The cook drank a tumblerful at 10 p.m., slept undisturbed, and was not attacked with colic, diarrhœa, and vomiting until 7 a.m. the next morning. The incubation period of nine hours excluded metallic poisoning, and put difficulties in the way of the assumption that the symptoms were due to toxins alone, no living bacilli being present after the alleged boiling of the milk. The housemaid took a tumbler of the milk at 10 p.m., and within two hours was seized with vomiting and diarrhœa, which continued through the night. The wife, retiring late, woke about 3 a.m., and drank a similar quantity of the milk. Within an hour she began to suffer from colic. At 7 a.m. she was seized with severe diarrhœa, but did not vomit. In all three cases the temperature rose above 100° F. All houses receiving the same milk were said to have been visited by a representative of the dairy concerned, who failed to obtain any history of other cases of illness among his customers. Bacteriological examination of the milk delivered in the affected house did not reveal the presence of any of the bacteria commonly associated with food poisoning. The results of analysis for metallic poisons were also negative.

Dr. W. A. BOND: It may interest the meeting to know that I had a similar outbreak of food poisoning amongst the staff of a large restaurant in the Holborn Borough in July, 1909. In all thirteen persons were attacked, ten waitresses and three of the kitchen staff. The first information I had of the outbreak was in a letter from a doctor stating that he was attending a waitress at that restaurant who was suffering from gastro-enteritis apparently due to food poisoning, and that she informed him that a number of waitresses at the same establishment became ill on the same day. I did not receive this letter until the Monday afternoon, the illness having begun early on the previous Friday morning. I at once went to the restaurant and made inquiries respecting the matter, and was informed by the assistant manager that he would at once obtain the consent of the managing director to let me have the home addresses of the waitresses and kitchen staff who were ill. The same evening I visited the waitress whose address I had received, and the doctor in attendance on her. The following morning I received a list of the staff who were ill and their addresses. I visited as many as I could that day, but as many of them lived in distant suburbs I could not see them all before

the following day. I found that they had all suffered from severe vomiting and diarrhoea, abdominal pain and fever, and about half the patients were still in bed. The illnesses began at various periods, from about midnight on Thursday to the latter part of the afternoon of Friday. I made careful inquiries of all the staff of the food and drink they had had on the Thursday at the restaurant. I found that the only food that all the persons who were ill had eaten in common was milk, all of them, with one doubtful exception, having had it in the form of junket or custard, or both. The restaurant premises were in excellent condition. The company has a number of branches in London, but the dairy company supplying this branch did not supply any other branch, and I was informed that there had been no other similar illness amongst the staff at any other branch. I made inquiries of the dairy company supplying the milk, who afterwards informed me that they could not tell from which farm the milk was supplied. I had read of two similar outbreaks amongst the patients and staff of St. Bartholomew's Hospital, in both of which Professor Klein found the *Bacillus enteritidis sporogenes* in the milk, the motions of the patients, &c. I was therefore of opinion that this milk was probably also contaminated with sewage or horse-dung containing the *Bacillus enteritidis sporogenes*.

Lieut.-Colonel WILKINSON, in referring to the statement that rats were almost unknown on the farm, remarked that this seemed to be a very unusual condition, and asked if there were any special circumstances to account for it. The abortion of two cows two years ago, and the illness of a third, in addition to that of the cow whose milk gave rise to the Gaertner epidemic, suggested the possibility that the absence of rats might be due to the infection of the farm premises with the bacillus of Gaertner. With reference to Dr. MacFadden's paper, he asked if some of the persons last attacked might not have derived their infection from earlier cases.

The PRESIDENT (Dr. W. H. Hamer) said he would now ask Professor Hutchens and Dr. Kerr to reply on the discussion. He hoped, if time permitted, that Dr. Kerr would be able to refer to the question raised as to the houses, other than those in which affected persons were found, in which the source of milk supply was investigated. Special stress had been laid upon bacteriological proof of causation, but it would be interesting to know how far there was independent statistical proof of the relation of the milk to the outbreak, based upon investigation of the extent to which the incidence of the disease in Heaton was limited to persons who had obtained their milk from dairies and shops supplied from the suspected source. Again, he thought the point raised by Mr. Sheather was a particularly interesting one, and doubtless Professor Hutchens would say something about it. How far was the analogy of hog cholera applicable? Were they to regard the Gaertner bacillus as the *causa causans*, or had they to reckon in these food poisonings, as in hog cholera, with an ultravisible virus? Questionings of this kind assailed them in connexion with many a supposed causal organism, but the case of the

Bacillus enteritidis of Gaertner was especially provocative of such speculation, for they were told that true Gaertner bacilli were common in the intestines of certain animals, and it was agreed that para-Gaertner and pseudo-Gaertner bacilli abounded in the alimentary canal of man himself. These facts naturally prompted inquiry as to the existence of some *causa causans* capable of initiating symptoms of illness and at the same time of favouring the transformation of the para- and pseudo-bacilli into true Gaertner organisms. The existence of such an agency would explain some of the difficulties which had been referred to in the discussion, and notably that of Professor Delépine, who had pointed out that his Gaertner cultures were lacking in marked virulence, and that of Professor Martin, who found that naturally occurring disease showed much more pronounced power of spread than was exhibited upon employment of material prepared in the laboratory.

Professor HUTCHENS, in reply, said that probably the point of greatest importance raised by the discussion had reference to the method by which the milk became contaminated, that is to say, whether it was infected from the blood-stream or solely by contamination from the excreta. The fact that Gaertner's bacillus was isolated from the spleen and mesenteric glands showed that the cow had an ante-mortem infection. Moreover, its recovery from the blood-stained milk in the udder further showed that the organism was present either in the blood or in the milk or in both. The milk in the udder could only be infected from the blood, and if the blood was infected it was at least highly probable that the milk was also infected. In a previous epidemic in which 105 people suffered from symptoms of "food poisoning" after drinking milk, Gaertner's bacillus was recovered from the milk on two consecutive days before the cow died. The cow in this case had also recently calved. In view of all the facts, there seemed no reason to doubt but that the milk was infected from the blood-stream. As regards the distribution of Gaertner's bacillus, it would appear from the records available that the organism had very rarely indeed been found in healthy cattle, whereas it had often been isolated from sick cattle. Winzer's observations, which had been mentioned, related to "calves showing evidence of septicæmia," so that these merely confirmed previous experience. There was no ground whatever for supposing that a filterable virus was the true agent of infection in these cases. The case of swine fever was entirely different. Long before the virus of that disease was discovered it was suspected that the *Bacillus suispestifer* was not the true cause of the disease.

Dr. KERR (reply): The inquiry was carried out by men specially picked on account of their experience and discretion in similar work, and their instructions were to visit all houses stated by the farmer and dairymen to be ordinarily supplied by them, and any others they subsequently or incidentally heard of as receiving the farmer's milk. They were simply to ask as to recent cases of illness, and without putting leading questions, to discover, so far as possible, the relation of milk consumption to illness; also to note specially the mode of use of the milk—raw, cooked, or in tea or other food—by the persons

affected and unaffected. Before their inquiry had commenced the rumour was rife in the district that it was the milk that was at fault, and nearly all replies referred at once to the milk. No reliance should be placed upon the statement frequently volunteered that the Friday afternoon's milk had a peculiar taste. Had the witnesses been pressed, doubtless they could have been got to remember that the milk was also red or green, or exhibited some other equally peculiar characteristic, so wonderful are the results of imagination and suggestion. Although only one or two special instances where the drinker of boiled milk was unaffected are specifically mentioned in the above report, many such cases were found. The apparent discrepancy between the figures in the first and subsequent tables above are due to the fact that the first one refers only to the lists of regular customers, as supplied by the farmer and dairymen, whereas the others include many additional households, found during the house-to-house inquiry, which also received the milk, while a number of the regular customers proved not to have been getting it. The first table is given to show one of the difficulties that one meets in an inquiry of this kind if one does not confirm all evidence. There were no known coincident cases of sickness and diarrhoea among people using other milk than that of the supply in question. The infection might quite well have come from the milking or milkings prior to that of the Friday afternoon, and it is not suggested that that lot of milk alone was to blame for all the cases of illness. The uterus of the cow was already in a state of decomposition when sent to the laboratory on the Monday morning. It was large, thickened, friable, and offensive, which may have been due to a condition of metritis, or solely to decomposition, in an organ enlarged as the result of recent calving. No considerable quantity of grain or other foodstuff is stocked on the farm, hence, probably, its comparative immunity from rats. With reference to rat viruses, and their possible connexion with outbreaks of gastro-intestinal disorder, it was felt to be inadvisable to lay down any of these at the Newcastle Small-pox Hospital, where there has been recent complaint of rats, owing to the temporary use of the wards for scarlet fever convalescents from the City Hospital for Infectious Diseases, and with this opinion the director of the manufacturing laboratory agreed.

Section of Epidemiology and State Medicine.

May 22, 1914.

Dr. W. H. HAMER, President of the Section, in the Chair.

Notes on the Prevalence of Tuberculosis in India.

By Lieut.-Colonel E. WILKINSON, F.R.C.S., I.M.S.

At the Third All-India Sanitary Conference, held at Lucknow in January, 1914, a resolution was adopted which affirmed "that the present prevalence of tuberculosis in India is such as to demand serious attention and special measures for dealing with it."

The subject had, in fact, been engaging attention in India for some years past, and was dealt with in a series of papers read before the Medical Section of the Asiatic Society of Bengal in 1908. Following upon the discussion of these papers a resolution was passed in which, after reference to the wide prevalence of tuberculous disease in Bengal, the opinion was expressed that "it is an extremely common cause of great suffering and mortality both among the European and Indian communities."

Two years later there was a short discussion on tuberculosis at the First All-India Sanitary Conference at Bombay, and at the second of these conferences, held at Madras in 1912, a resolution was adopted, part of which ran as follows: "That statistics appear to show that the disease" (tuberculosis) "is rapidly increasing in India, but that it is doubtful whether the increase is real or apparent only and due to such causes as more accurate diagnosis and registration." The resolution went on to affirm the necessity for inquiry and to recommend measures to check the spread of tuberculosis.

These papers and resolutions had reference to the free civil population of India only, and it is with this population that I propose to deal in these notes. The subjects of tuberculosis in the Army and among

prisoners in India have long been receiving the careful consideration of the authorities concerned, but I shall refer to them only in connexion with their bearing upon the prevalence of tuberculosis among the ordinary population.

In view of the opinions expressed in the resolutions just mentioned it is somewhat remarkable that the literature of Indian tuberculosis should be as scanty as it is. The subject is, of course, dealt with in the Annual Reports of the Sanitary Commissioner with the Government of India, but only as affecting the Army and prisoners, and, with a few important exceptions, most of the references to it in the *Indian Medical Gazette* between 1900 and 1908 deal with these two aspects of the question only. Further, none of the numerous papers read at the Indian Medical Congress at Bombay in 1909 dealt directly with the subject of pulmonary tuberculosis in India, and the indirect references to it in these papers, and in the resulting discussions, were few and meagre. The Transactions of the First Indian Medical Congress at Calcutta in 1894 included a paper entitled "The Possible Antagonism between Malaria and Phthisis," but this merely mentioned that both diseases existed in India.

It would thus appear that until recent years tuberculosis was considered to be of comparatively little consequence to the general population of India, and a reference to the earlier medical works on India tends to confirm this view. Thus, Norman Chevers in his "Commentary on the Diseases of India," written in 1886, as the result of his thirty-eight years' experience speaks of phthisis as being "comparatively rare in India," and quotes his own experience as confirming that of several of his predecessors in regard to the great rarity of "scrofulous" diseases of glands, bones and joints. He, however, like Ewart, Moorhead, Goodeve, and earlier writers, was alive to the possibility of cases of tuberculosis being overlooked owing to the greater prominence of abdominal symptoms than of those of the chest, which frequently obtains in India, and to the danger of the hectic fever of phthisis being mistaken for malaria.

It is noteworthy also in the early literature of tuberculosis in India how much greater prominence was given to the consideration of the disease in Europeans, relatively to its occurrence in Indians, as compared with what obtains to-day.

In attempting to estimate the prevalence of tuberculosis in India, a serious difficulty is at once encountered, owing to the scarcity of reliable statistical evidence. The mortality returns of the general population,

published by the imperial and provincial Sanitary Commissioners, do not contain any reference to tuberculosis, the only headings being those of "cholera," "small-pox," "plague," "fevers," "dysentery and diarrhoea," "respiratory diseases," "injuries," "all other causes" and "all causes." These returns are compiled from others furnished by civil surgeons and district medical and sanitary officers, the bases of which are the municipal and police-station registers of deaths occurring in urban and rural areas respectively.

In towns the obligation to register deaths is laid upon householders, but deaths occurring in villages, in which over nine-tenths of the 240 million people of British India live and die, depend for their registration upon the village watchmen. The watchmen are lowly and illiterate persons, and unless they can obtain the friendly offices of someone, such as the village accountant or shopkeeper or schoolmaster, to write up their registers, they are dependent upon their memories for details of the births, deaths and other occurrences which they are required to report at their fortnightly visits to the police-stations. Neither in towns nor villages are deaths certified, the vast majority of the people dying either without medical attendance, or with only that of practitioners of indigenous systems of medicine, more concerned with treatment than with pathology.

The clerks in the civil surgeon's offices are furnished with lists showing the heads under which the causes of death entered in the vernacular registers should be included in the English returns. Many vernacular terms are necessarily included under a single English heading, and in this way a certain amount of information concerning the reported causes of death is lost. To take phthisis, for example. There is a term "*tap-dikh*" well known throughout the Punjab, the meaning of which corresponds almost exactly with that of our own word "consumption"; in the mortality returns deaths from this cause are included under "respiratory diseases," and thus such indication of the prevalence of phthisis as is furnished by the vernacular registers is lost. I do not suggest that a column for "phthisis" or "tubercle of the lungs" should be added to the general mortality returns, for the information available is far too unreliable to justify such a procedure. I think, however, that inquiries into the prevalence of tuberculosis in India might be facilitated were records maintained in civil surgeons' offices of entries in the death registers of "*tap-dikh*" and the corresponding terms in other vernaculars.

In some of the larger towns attempts are made to check the entries

in the death registers by inquiries at the burial and burning grounds, but as these inquiries are not made by medical men they are of little value as evidence of the causes of death except of such as are easily recognized by the people themselves. In the great cities, however, such as Madras, Calcutta and Bombay, systems have been instituted in recent years under which all deaths are inquired into by medical men, and the reports and returns published by the Health Officers of these cities afford the only available information concerning the mortality caused by tuberculosis amongst the general population. These inquiries have been made in Bombay from 1902 onwards, and in Calcutta and Madras from 1905.

The statement below shows the mortality from phthisis and "all causes" in the cities of Madras, Calcutta and Bombay from 1901 to

STATEMENT I, SHOWING THE DEATHS FROM PHTHISIS AND FROM ALL CAUSES IN THE CITIES OF MADRAS, CALCUTTA AND BOMBAY, FROM 1901 TO 1911.

Year	MADRAS				CALCUTTA				BOMBAY			
	Deaths from phthisis		Deaths from all causes		Deaths from phthisis		Deaths from all causes		Deaths from phthisis		Deaths from all causes	
	Number	Rate per 1,000	Number	Rate per 1,000	Number	Rate per 1,000	Number	Rate per 1,000	Number	Rate per 1,000	Number	Rate per 1,000
1901	588	1.1	11,352	22.2	1,064	1.2	—	—	6,516	8.39	59,495	76.66
1902	444	0.3	9,340	18.3	1,350	1.5	—	—	3,957	3.09	48,414	62.38
1903	278	0.5	9,312	18.2	1,580	1.8	—	—	2,842	3.66	50,513	65.09
1904	348	0.6	9,175	18.0	1,608	1.8	—	—	—	—	—	—
1905	832	1.6	12,348	24.2	2,052	2.4	32,181	38.0	2,558	3.29	47,762	61.54
1906	736	1.4	23,794	46.6	2,201	2.6	30,293	35.7	3,567	3.64	52,874	54.07
1907	641	1.2	20,668	40.5	2,241	2.6	31,942	37.6	2,877	2.94	38,687	39.56
1908	747	1.4	22,285	43.7	2,101	2.5	27,689	32.6	2,387	2.44	38,271	39.13
1909	646	1.2	19,354	37.9	1,949	2.3	28,946	34.1	2,415	2.45	34,878	35.66
1910	202	0.4	20,312	39.8	1,971	2.3	23,728	27.9	2,282	2.33	34,933	35.72
1911	203	0.4	22,177	42.0	2,060	2.3	24,396	27.2	2,078	2.12	34,961	35.69

1911. Throughout this period the phthisical death-rate of Madras has been the lowest, having varied between 1.6 in 1905 and 0.4 in 1910 and 1911. The earlier ratios of Bombay were high, even excluding the rate of 8.39 of 1901, which seems open to question. Since 1906 onwards there has been an almost steady decline in the phthisis death-rate from 3.64 to 2.12 in 1911. The Calcutta rates increased from 1.2 in 1901 to 2.6 in 1907, since when there has been a decline to 2.3, and these rates have been somewhat similar to those of Bombay.

The other mortality statistics remaining for consideration are those of the Army and of prisoners in Indian jails, and as these are based upon statements furnished by fully qualified medical men, usually officers of the Royal Army Medical Corps or of the Indian Medical Service, it might be expected that they would be useful for estimating the prevalence of tuberculosis among the general population. Apart, however, from other reasons, the value of the mortality returns of the Army is greatly lessened owing to the fact that soldiers suffering from tuberculosis are commonly invalided before the disease has reached a very advanced stage, and their deaths thus become merged in those of the general population; to a less degree a similar statement applies to the prison death returns, as many prisoners suffering from tuberculosis are released on the expiry of their sentences.

There remains another class of statistics, namely, the returns of the hospitals and dispensaries maintained by Government and local bodies throughout India. These returns are published annually by the heads of the provincial medical departments, together with reports or notes, and they show the number of admissions and deaths under many more headings than are given in the mortality returns. The headings have varied from time to time, and it is only from 1910 onwards that the heading "tubercle of the lung" has been shown; the heading "tubercle other than of the lung" has been in use for many years.

Before examining these statistics a word is necessary as to their value, and as to the way in which I have used them. In the first place, it must be admitted that, like many other statistics published in India and elsewhere, they are frequently compiled under great pressure and by persons who may not fully understand what they are doing, and that consequently errors due to misclassification or miscalculation may sometimes be met with. It has also to be pointed out that the value of the diagnoses is by no means a constant factor. In the case of the large hospitals of the Presidency towns, or of provincial capitals—especially those which have medical schools attached to them—the same value can probably be assigned to the diagnosis—say of tuberculosis—as in the case of similar institutions at home. It is very different, however, in the case of many of the small country dispensaries, which furnish the great bulk of out-patient statistics. These are in charge of men of very varying medical qualifications, whose means of diagnosis are equally varied. It is probably correct to say, therefore, that the diagnoses of but a minute fraction of the

cases shown in the following statements under the heading of "tubercle" have been verified by pathological examination. I think, however, that there is less likelihood of the cases shown as tubercle to have been incorrectly diagnosed than for the error to have been in the opposite direction. I have only dealt with admissions, as few phthisical patients await the fatal termination of their disease in hospitals.

The statement opposite (No. II) shows the total number of persons treated in the hospitals and dispensaries of Madras, Bengal, Bombay, Burma, the Punjab, and the United Provinces from 1891 onwards, together with the number of patients treated for tuberculosis and the ratios of the latter series of figures to each thousand of the former; this ratio may be referred to for convenience as the "tubercle ratio." Similar details are shown separately for the cities of Madras, Calcutta, Bombay, Rangoon and Lahore.

This statement has been compiled from Statement C of the annual provincial returns of hospitals and dispensaries, and in order to reduce the bulk of figures as much as possible five-yearly means of the years 1891 to 1910 have been shown, instead of the actual figures given in the official returns; this procedure has also had the advantages of reducing the number of ratios to be calculated and of eliminating small variations occurring in the annual returns.

I have chosen this method of obtaining data for attempting to estimate the prevalence of tuberculosis in India, in preference to that of calculating the ratios of admissions for this disease upon the total population, because owing to the changes which have been made in provincial boundaries since 1891 the task of obtaining ratios which could be properly compared would be very great, and the data so obtained would not, I think, have been any better than that contained in the statement. For reasons already mentioned it might not be wise to ascribe any high value to some of the figures in the statement. Admitting this, however, and also admitting that some of the figures need explanation, I think it may be claimed for the statement that its numbers are sufficiently large and homogeneous to permit of the deductions I have based upon them being free from serious error.

As judged by the "tubercle ratios," it would appear that tuberculosis has been on the increase almost throughout India during the whole of the twenty-two years under review. The ratio of every city and province shown in the statement for 1911-12 is greater, in many instances much greater, than that of 1891-95. Except in those of the cities of Madras, Rangoon and Lahore, the increases in the ratios have

STATEMENT II, SHOWING THE MEAN NUMBER OF PERSONS TREATED FOR ALL DISEASES AND FOR TUBERCLE IN THE UNDERMENTIONED PROVINCES, DURING FIVE-YEAR PERIODS FROM 1891 TO 1910, AND FOR THE TWO YEARS 1911 AND 1912.

MADRAS PRESIDENCY										BENGAL		
MADRAS CITY					MADRAS PRESIDENCY (excluding Madras City)					CALCUTTA		
Years	Mean number of persons treated	Mean number treated for tubercle	Ratio per 1,000 of persons treated for tubercle to total treated	Mean number of persons treated	Mean number treated for tubercle	Ratio per 1,000 of persons treated for tubercle to total treated	Mean number of persons treated	Mean number treated for tubercle	Ratio per 1,000 of persons treated for tubercle to total treated	Mean number of persons treated	Mean number treated for tubercle	Ratio per 1,000 of persons treated for tubercle to total treated
1891-95	111,550	415	3.71	3,351,080	3,450	1.03	271,548	503	1.85	1,960,316	1,076	0.87
1896-1900	214,567	1,010	4.70	4,175,477	4,828	1.15	261,819	1,145	4.37	3,031,438	2,975	0.98
1901-05	249,357	1,082	4.33	4,784,408	5,909	1.23	236,670	2,152	7.50	3,731,297	4,164	1.11
1906-10	268,883	1,071	3.98	5,171,098	7,809	1.51	315,753	2,401	7.60	2,855,888	3,984	1.39
1911-12	292,914	1,432	4.88	5,789,448	10,020	1.73	*329,229	2,837	8.61	*3,270,299	5,675	1.73
BOMBAY PRESIDENCY												
BOMBAY CITY			PRESIDENCY (excluding Bombay City)					RANGOON				
Years	Mean number of persons treated	Mean number treated for tubercle	Ratio per 1,000 of persons treated for tubercle to total treated	Mean number of persons treated	Mean number treated for tubercle	Ratio per 1,000 of persons treated for tubercle to total treated	Mean number of persons treated	Mean number treated for tubercle	Ratio per 1,000 of persons treated for tubercle to total treated	Mean number of persons treated	Mean number treated for tubercle	Ratio per 1,000 of persons treated for tubercle to total treated
1891-95	109,584	375	3.42	2,096,750	1,014	0.48	54,131	311	5.7	474,917	288	0.60
1896-1900	95,301	1,130	11.85	1,851,865	2,029	1.09	59,924	478	8.3	734,536	473	0.64
1901-05	181,160	2,268	12.52	1,837,491	4,114	2.24	67,655	320	4.7	907,053	591	0.65
1906-10	206,589	2,633	12.74	2,052,425	6,567	3.20	94,423	639	6.7	1,063,370	1,224	1.15
1911-12	182,925	2,871	15.69	2,085,900	9,056	4.35	130,782	1,039	7.94	1,387,242	1,878	1.35
PUNJAB												
Lahore City			Punjab (excluding Lahore City)					UNITED PROVINCES				
Years	Mean number of persons treated	Mean number treated for tubercle	Ratio per 1,000 of persons treated for tubercle to total treated	Mean number of persons treated	Mean number treated for tubercle	Ratio per 1,000 of persons treated for tubercle to total treated	Mean number of persons treated	Mean number treated for tubercle	Ratio per 1,000 of persons treated for tubercle to total treated	Mean number of persons treated	Mean number treated for tubercle	Ratio per 1,000 of persons treated for tubercle to total treated
1891-95	51,422	247	4.5	3,087,911	5,298	1.71	3,627,237	6,486	1.79			
1896-1900	43,038	125	3.1	2,619,317	4,466	2.07	3,827,291	6,052	1.58			
1901-05	39,406	270	6.8	3,184,286	5,053	1.58	3,675,482	6,772	1.84			
1906-10	37,616	295	7.8	4,189,118	8,664	2.07	4,412,366	11,187	2.53			
1911-12	33,494	501	14.9	4,303,650	13,254	3.08	4,429,862	15,340	3.46			

* These figures are for the year 1911.

been continuous. In the ratios of Madras city the fluctuations have been within narrow limits probably not greater than normal periodic variations, and in those of Lahore the increase has been great and uninterrupted from 1896-1900 onwards. The great increase in the ratio of Lahore from 7·8 in 1906-10 to 14·9 in 1911-12 requires explanation, however, before it can be accepted as correct. The fluctuations in the "tubercle ratios" of Rangoon were considerable and irregular during the first three lustra, but the increase in the ratios has been continuous throughout the last twelve years. The ratios of the cities have been in every instance much higher than those of their provinces, and this is the case also as regards the increases in the ratios, with the exception of that of Madras city. Accepting the "tubercle ratios" as an index of the prevalence of tuberculosis, Bombay would appear to have been for many years the most infected city, and this Presidency the most infected province in India. Following these during recent years are respectively the cities of Lahore, Calcutta, Rangoon and Madras, and the United Provinces, the Punjab and Burma, Bengal and the Presidency of Madras, in the order given.

For comparison with this statement I have prepared another showing the hospital admission-rates for tuberculosis per 1,000 prisoners in the jails of different provinces, and of all India, for alternate years from 1891 to 1911.

STATEMENT III.—ADMISSION-RATES. PRISONERS IN JAILS OF CERTAIN PROVINCES IN INDIA.

Tubercle of the Lungs (rates per 1,000).

Year	Madras	Bengal	Bombay	Burma	United Provinces	Punjab	North-West Frontier Provinces	Central Provinces	Andamans	India including Andamans
1891	2·5	3·7	1·0	2·2	3·7	2·4	—	1·5	1·0	2·6
1893	4·4	6·8	0·8	5·8	3·3	3·9	—	1·4	—	3·7
1895	9·0	7·5	7·8	5·6	4·2	5·8	—	5·0	3·1	5·5
1897	15·3	7·6	7·1	5·9	6·4	5·8	—	5·8	5·3	6·9
1899	10·8	10·8	5·9	9·5	6·7	6·6	—	2·9	10·3	8·8
1901	12·0	9·4	5·6	9·9	8·6	8·7	3·2	5·2	10·8	8·8
1903	12·2	12·5	6·3	7·5	7·7	6·3	4·7	6·1	13·3	9·3
1905	9·7	13·5	5·0	7·3	7·6	7·3	7·7	3·9	6·9	8·6
1907	6·5	12·5	5·8	4·9	5·4	10·6	8·5	4·0	8·2	7·6
1909	10·1	12·9	3·7	8·0	10·0	15·4	9·4	4·0	8·4	9·7
1911	13·1	9·0	3·7	6·9	7·4	24·9	2·5	13·4	5·8	9·9

In comparing the ratios in the two statements it must be borne in mind that those of the hospitals and dispensaries are calculated upon the number of persons actually seeking medical relief, and those of jails

upon the total number of prisoners. The two statements resemble each other to the extent that the earlier ratios are everywhere lower than those of later years, and thus agree in indicating that tuberculosis is on the increase throughout India. All the prison ratios resemble those of the cities more than those of the provinces, and in most instances the rises in the prison ratios have been much greater than those of the cities; this is markedly so as regards the ratios of the jails of Madras and the Punjab; the ratios of the Bombay jails however are much lower than those of the city.

As to the cause of the high prevalence of tuberculosis in jails, a hint, I think, is furnished by the greater resemblance just referred to of the jail-rates to those of cities than of provinces. While in both cities and jails more accurate diagnosis may account for some of the increase in the admission-rates for tuberculosis, by far the most important factor is furnished by the conditions of overcrowding which prevail in cities and in many jails. The reports of the Sanitary Commissioner with the Government of India and of the provincial Inspectors-General of Prisons, have for many years contained references to the serious overcrowding of prisoners in jails, and recommendations have been made for the extension of accommodation, the provision of special wards for tuberculosis, and for other means of checking the spread of the disease.

The published statistics of tuberculosis in the native army in India do not admit of exact comparison with those I have given for the general population and for prisoners, as they refer either to military divisions or to geographical groups, the areas of which do not correspond to those of provinces. Moreover, the obvious differences in the constitution of the Army and of the civil population, and in the conditions affecting them, have to be borne in mind in comparing statistics of the two groups. The European troops are not, of course, representative of any of the populations of India, and as recruitment for the Indian Army is limited to comparatively few of the races of India the native troops of any given area are not necessarily representative of the general population of that area; there are, for example, no Burmese troops, and the populations of Bengal and Madras are but poorly represented in the Army; further, in many of the geographical areas the garrisons are very small and the ratios calculated upon their strengths are thus unstable. The geographical groups containing the largest garrisons are those of the Gangetic Plains, the Upper-sub-Himalayan, the North-West Frontier, Indus Valley, North-west Rajputana, South-east Rajputana,

and the Deccan; and the first three of these areas furnish a large proportion of the native army. The admission-rates for tuberculosis per 1,000 strength of native troops in some of these areas and in the whole of India for alternate years from 1891 to 1911 are given in the statement below. The rates for European troops in the whole of India are also given.

STATEMENT IV.—ADMISSION-RATES, NATIVE TROOPS.

Tubercle of Lungs (ratio per 1,000).

Geographical groups	1911	1909	1907	1905	1903	1901	1899	1897	1895	1893	1891
Gangetic Plain ...	2·7	2·8	2·5	3·4	3·1	8·4	3·6	3·5	2·6	2·8	2·1
Upper-sub-Himalaya	2·8	2·7	2·8	4·7	7·9	5·6	5·5	4·6	4·0	3·1	3·1
N.-W. Frontier, Indus Valley and N.-W. Rajputana	2·5	2·9	3·1	4·5	5·1	4·8	3·8	3·7	2·0	2·1	2·7
Deccan ...	2·2	1·2	0·8	0·6	1·4	1·7	1·0	1·6	2·1	0·7	0·5
Western Coast ...	1·0	1·1	7·9	3·5	1·0	1·5	3·3	2·8	1·9	0·3	0·3
India ...	2·1	2·3	2·5	3·1	5·9	4·2	3·3	2·6	2·3	1·6	1·7
European Troops in India	0·9	1·1	1·6	2·1	3·4	3·4	3·1	4·2	4·8	3·0	3·2

These ratios, like those in the statements concerning the general population and prisoners, increase from the earlier years. They differ, however, in that the rise is followed by a decline from 1903, and from the remarks in the reports of the Sanitary Commissioner with the Government of India, from which the figures are taken, it is evident that the decline has followed measures taken to check the spread of tuberculosis in the Army; important among the measures has been the provision of better accommodation, thus relieving the overcrowding to which the high prevalence of the disease was largely attributed.

The subject of tuberculosis in the Indian Army is discussed in an interesting paper by Major C. A. Johnston, I.M.S., in the *British Journal of Tuberculosis* for 1908.¹ He comes to the conclusion that, after making allowance for improvement in diagnosis and for the special susceptibility of Gurkhas to the disease, the increase of tuberculosis

¹ *Brit. Journ. of Tuberculosis*, 1908, ii, pp. 20-34.

in the Native Army is associated with an increase in its prevalence among the general population.

In order to supplement such evidence as is afforded by the statistics, which I have been able to collect regarding the prevalence of tuberculosis in India, I have written to a number of medical practitioners in India, officers of the Indian Medical Service, medical missionaries, and others, and have asked them to favour me with the results of their experience. I am indebted to many of these for interesting and instructive replies, which afford valuable evidence of the extent to which tuberculosis prevails in India.

Many of my correspondents are medical missionaries, whose evidence I regard as of special value from the circumstance that they are subject to far less frequent transfers than are Government officials, and are thus better able to form an opinion as to the prevalence of any particular disease—such as tuberculosis—in their localities, and as to the extent to which this prevalence has varied over a long series of years. Besides this, medical missionaries are usually in much closer touch with the people than are “Government doctors,” and they see them not only at hospitals and dispensaries, but at their houses. The stress of their work is, however, usually great, and but few of them are able to furnish statistics.

Dr. A. Neve, who has been in charge of the Kashmir Mission Hospital, Srinagar, ever since 1881, has, however, furnished me with some figures which, though only approximate, give an idea of the increase in the numbers of tuberculous patients treated in his hospital during the last twenty years. Thus, he says that in 1913 there were about 200 cases of phthisis as compared with less than 40 cases twenty years ago; and that the operations for tubercular glands, which numbered from 10 to 15 in the eighties, and from 12 to 25 in the nineties, have, since 1900, amounted to between 30 and 60 per annum. There has also been a large increase in the total numbers of attendances at the Hospital, and Dr. Neve mentioned that a number of cases in 1913 had come from the Punjab. It may be pointed out here that a difficulty which exists in India (as doubtless it does elsewhere) with regard to the use of hospital returns for estimating the prevalence of any particular disease is occasioned by the way in which patients are attracted by the reputations of medical men or by the facilities which exist for treatment. In this way is explained, for example, the very large number of patients treated for diseases of the eye at certain hospitals in the Punjab, and doubtless the higher “tubercle ratios” of

Indian cities than those of provinces are, to a lesser degree, similarly explicable.

In his hospital reports for 1912 and 1913, Dr. Neve refers to the rapid increase of tuberculosis in Kashmir, and among others whose long experience has convinced them of the wide and increasing prevalence of tuberculosis in different parts of India are Dr. Lankester, of Peshawar; Dr. Lechmere Taylor, of Jalalpur Jattan (Punjab); Colonel Hendley, I.M.S., and Lieut.-Colonel Sutherland, I.M.S., Principals (past and present) of the Medical College, Lahore; Dr. Jenny Müller, of Delhi; Dr. (Miss) Dawson, of Cawnpore; Rev. Dr. Kennedy, formerly of Chota Nagpur, and Colonel Harris, I.M.S., Inspector-General of Civil Hospitals, Bengal. Others of my correspondents have expressed similar opinions, but I have only mentioned those whose experience in India and in the localities of which they speak has extended over many years. I may add that not one of my many correspondents has expressed any doubt as to the importance of tuberculosis as a factor in Indian morbidity and mortality, or even, indeed, of the increase of the numbers of their patients with signs of this disease. Some, however, have questioned whether the increase in the disease is real or is apparent only, and due to such causes as improvement in diagnosis, easier access to hospitals resulting from improved communications, and increasing appreciation by the people themselves of the seriousness of the disease, leading to earlier and freer resort to medical treatment.

Admitting that all these causes may have contributed to the increase in the number of patients attending hospitals for tuberculosis, they are, I think, sufficient to account for the other features of the prevalence of the disease. If improved diagnoses were an important factor in the apparent prevalence of tuberculosis, it remains to be explained why the increase has been so much less in Madras than in Bombay and Calcutta, or why a decrease should have occurred in the admission-rates for tubercle in the Army in India during recent years.

Improvements in communications may have brought more patients to the hospitals, but there seems to be no reason for supposing that persons suffering from tuberculosis should have availed themselves of these improvements more freely than other classes of patients. I agree that improvement in communications has contributed towards the increase in tuberculosis in India, but I think that the way in which it has done so has been by providing greater facilities for the spread of infection.

As for the greater appreciation of the dangers of tubercle leading to

earlier resort to medical treatment, I think that this has been operative, but I consider that this appreciation has resulted from recurrent object-lessons provided by the actual increase of the disease.

Admitting that tuberculosis has really and not only apparently increased in India during recent years, it remains to be considered why this increase should have occurred.

I attach a statement showing for the last few decades the numbers of persons employed in certain industries, carried on railways and receiving education, thereby indicating the increases which have occurred in industrialism, in communications, and in education, which, I believe, to have been, in the order named there, the chief factors concerned in the increased prevalence of tuberculosis in India.

STATEMENT V.—STATISTICS OF POPULATION, EDUCATION, INDUSTRIES, AND PASSENGER TRAFFIC ON RAILWAYS IN INDIA.

Years	Total population	Total persons receiving education	Total persons engaged in cotton and jute industries	Total persons carried on railways for years shown
1880-81	253,891,900	—	—	12,046,000 (1882)
1890-91	287,358,608	3,846,820	173,696	127,457,000 (1892)
1900-01	294,361,056	4,529,491	267,627	190,684,000 (1902)
1911-12	315,132,537	6,795,971	438,171	431,212,000 (1912)

The principal increases in industrialism have occurred in the great cities of Bombay and Calcutta, the headquarters respectively of the cotton and jute industries, where they have brought about a high degree of overcrowding; this coupled with the direct effect of these industries upon the workers themselves has furnished specially favourable opportunities for the spread of tuberculosis, the infection of which was already present in those cities.

As to the effects upon the workers themselves, it is to be noted that in his evidence before the Indian Factory Labour Commission, Dr. Turner, Health Officer of Bombay, while stating that the death-rates from respiratory diseases and "all causes" were lower among mill operatives than among general labourers, stated that their death-rate from phthisis was 2.38 as compared with that of 2.26 among general

labourers. Both these rates, it may be remarked, are very high, and it may be added that Major Street and Captain Gordon Tucker, both on the staff of one of the great hospitals of Bombay, gave evidence as to the great prevalence of tuberculosis, pulmonary and glandular, among mill operatives.

A feature of Indian industrial occupation is that much of it—such as that in cotton mills and jute factories—is seasonal, the operatives crowding into the cities for a few months of the year, and spending the rest of their time in the villages. This, while it tends to obscure the real extent of the phthisical death-rate in the cities, must greatly facilitate the spread of tuberculosis in other places.

I do not propose to describe the housing conditions of Bombay and Calcutta. It will be sufficient to quote a statement of Dr. Turner in a paper he read at the Second All-India Sanitary Conference, that 76 per cent. of the population of Bombay live in one-room tenements, and to add that many of these tenements are six or more stories high, and are not only built almost back to back, but are of excessive depth, with only a narrow "sweeper's passage," often not more than 2 ft. wide between blocks. Similar conditions, though to a less serious degree, exist in Calcutta, and in both cities special Improvement Trusts have been created during recent years, whose duties are largely concerned with the provision of better housing for the working classes.

It is not only in the cities of Calcutta and Bombay that the housing conditions are favourable to the spread of tuberculosis. Most of the large towns of India contain areas in which many-storied buildings are closely packed together, back to back and side to side, the rooms in which are dependent for light and air upon a small central court, no through ventilation being possible. Such buildings are occupied, not only by the poorer classes, but by the well-to-do, and in both cases are commonly densely populated—high rentals bringing this about in the case of the poor, and the joint family system in the case of the well-to-do; many of the latter also by observing the purdah system expose their women especially to the unhealthy influences of such habitations.

Although in the villages and the small towns such close aggregation of buildings does not exist, yet the houses themselves are usually very imperfectly ventilated. A very common type of house in Northern India consists of three rooms, one behind the other, of which only the first has any direct access to the outside air.

Except in the larger towns, the evils arising from defective housing

are greatly minimized by the fact that the people spend a large portion of their lives out of doors—sleeping as well as working in their court-yards. This, however, is only possible during fine and warm weather, the rainy season in the southern, and the winter in the northern and hilly parts of India, driving the people into their houses, in which when the weather is cold they huddle together behind closed doors.

It is thus evident that, given the introduction of the infection of tuberculosis, housing conditions favourable to its spread are to be found almost throughout India.

This leads to the consideration of the second of the factors I have suggested as being of importance in the spread of tuberculosis in India, namely, the improvements in communications, especially in railway communication, with a consequent enormous increase in the passenger traffic. Railway travelling is cheap in India, and the migration of labour is enormous. The third-class carriages are usually densely crowded, and as spitting is freely practised, given the presence of a phthisical patient the conditions are very favourable for the spread of infection.

It is, however, I think, chiefly by facilitating the dispersal of phthisical persons from Bombay, Calcutta and probably other centres of labour, such as Cawnpore, Delhi and Lahore, to the villages and smaller towns, that improvements in communication have been instrumental in increasing the prevalence of tuberculosis in India.

Some of my correspondents have mentioned instances of the local spread of tuberculosis following upon the introduction of infection by phthisical patients from Calcutta, Cawnpore and other places.

I have mentioned education as a factor in the increase of tuberculosis in India because I have been struck with the frequency with which phthisical patients have been described as students or as belonging to the educated classes, and although I am unable to produce any direct evidence of infection having been acquired in schools, yet my experience of school buildings in India is that many of them are very imperfectly ventilated as regards both their classrooms and their sleeping accommodation. The conditions are certainly such as to lessen the resistance of scholars subject to them to the infection of tubercle, and to facilitate the spread of such infection should it be introduced. It is to be expected also that the extension of education leads to increase of sedentary indoor occupations, and it can hardly be doubted that under the imperfect sanitary conditions common in India this has contributed to the increased prevalence of tuberculosis.

I have been able to obtain very little reliable information regarding the incidence of tuberculosis in India in respect of race, class, sex, or age, or as to the extent to which the incidence is affected by climate or occupation—though some of these points have already been mentioned incidentally.

Below is a statement which I have compiled from the report of the Health Officer of Bombay for 1911, showing the death-rates from “phthisis” and “all causes” of certain classes of the population in that city.

STATEMENT VI.—MORTALITY PER 1,000 FROM PHTHISIS AND ALL CAUSES IN BOMBAY, 1911.

					Phthisis			All causes
Hindus	...	...	...	...	1·97	...	...	34·18
Mussulmans	...	...	...	...	3·86	...	...	46·29
Parsees	...	...	...	...	0·76	...	...	24·38
Eurasians	...	...	...	...	1·43	...	...	28·89
Europeans	...	...	...	...	0·25	...	...	20·68

This statement indicates that Mohammedans suffer most from phthisis and Europeans least, Hindus, Eurasians, and Parsees taking intermediate places in descending order. I expect, however, that the relative incidence here shown is more dependent upon conditions of life than upon racial proclivity to tuberculosis. In Calcutta Hindus and Mohammedans are about equally affected.

In the reports of the Sanitary Commissioner with the Government of India frequent references have been made to the great prevalence of tuberculosis among Gurkhas, and, as has already been seen, it has been suggested that they have a special susceptibility to the disease.

A medical officer of a Gurkha regiment, however, showed several years ago that phthisis in his regiment was confined to men living in the married lines, which were very ill ventilated; other medical officers have attributed the high admission-rates for tubercle of the lung among Gurkhas to the overcrowding and defective ventilation of their barracks—it has already been noted that improvements in barrack accommodation have been followed by a decline in the admission rates for tuberculosis in the Army in India. Dogras are another race to whom a special susceptibility to phthisis has been attributed. Many of them, like Gurkhas, are hillmen, and during several months of the year, when the weather is cold, they live under extreme conditions of defective ventilation. It is to this, rather than to any special racial proclivity, that, in my opinion, the frequency of tuberculosis among Gurkhas and Dogras is due.

Burmese have long been believed to suffer greatly from tuberculosis, but I have been able to find no evidence of their special susceptibility to this disease, except that, at a meeting of the Burma branch of the British Medical Association in 1900, the prevention of tuberculosis in India was the subject of a special discussion, during which it was stated that in Rangoon the Burmese and Chinamen were the chief sufferers from the disease. Elementary education has long been common in Burma, and it is noteworthy that one of the speakers at the meeting advocated better conditions in schools.

I have but little information to give regarding the class and incidence of tuberculosis in India other than what has been already mentioned.

Mention has been made of the high prevalence of the disease among the poor—such as mill operatives—and among the educated, that is, the well-to-do classes. Several of my correspondents have informed me that tuberculosis seems to be common in all classes of the population.

As to the sex-incidence of tuberculosis there is a strong consensus of opinion that females in India suffer far more than males, and this is attributed by many of my correspondents to the very unhealthy conditions under which the women live, especially those who observe the purdah system. Two medical missionary ladies have informed me that Indian women are very liable to phthisis after their first confinement—the disease usually running a rapidly fatal course.

The statement below shows the death-rates from tubercle, including tubercle of the lungs, among males and females in Madras, Calcutta and Bombay, from 1908 to 1912 :—

STATEMENT VII.

Year	MADRAS			CALCUTTA			BOMBAY		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
1908	0·2	0·2	0·2	2·0	3·3	2·5	0·51	0·87	0·65
1909	0·3	0·1	0·2	1·8	3·2	2·3	0·36	0·60	0·45
1910	1·9	1·8	1·8	1·8	3·2	2·3	0·44	0·77	0·56
1911	1·5	1·4	1·5	1·7	3·3	2·3	0·41	1·02	0·62
1912	1·3	1·3	1·3	1·7	3·2	2·1	0·51	0·84	0·6

It is to be noted that though in Madras the rates for males slightly exceed those for females, in Calcutta and Bombay the reverse is the case, the rates for females being much higher than those for males.

The high mortality of females from tubercle is borne out by the findings of Major Rogers in his paper on "Gleanings from the Calcutta Post-mortem Records," read before the Asiatic Society of Bengal in 1908. He has shown that 28·5 per cent. of the bodies showing signs of tuberculosis were those of females, though these formed only 23·5 per cent. of the total subjects; his figures also show the higher incidence of tuberculosis among Mohammedan females than among Hindu females, the figures corresponding to those just given, being 25·9 and 15 for Mohammedan females, and 29·8 and 26 for Hindus.

There is an unanimity of opinion as to the comparative infrequency of tuberculosis among children in India, but the only statistics I have been able to find relating to Indian children are some given by Major Rogers's paper just alluded to. He shows that 61 per cent. of the deaths from tubercle took place between 20 and 40 years, though fatal tubercle was relatively more frequent up to 20 years of age than after 40.

Lieut.-Colonel Pilgrim, in another paper in the same series, also gives a statement showing the age-incidence of tubercle as shown by the admissions to his General Hospital. These, however, relate only to Europeans. He states that of every 100 cases admitted four were tuberculous — the percentage for men, women, and children under 10 years being respectively 4·17, 6·05, and 1·15.

That phthisis is by far the most common form of tuberculosis in India has long been recognized. It is only, however, since 1910 that separate figures have been given for pulmonary and other forms of tuberculosis in the hospital and dispensary returns. These I have tabulated in the following statement:—

STATEMENT VIII, SHOWING ADMISSIONS FOR TUBERCULAR DISEASE OF THE LUNGS AND FOR OTHER TUBERCULAR DISEASES IN THE CIVIL HOSPITALS OF MADRAS, BENGAL, BOMBAY, AND BURMA, DURING THE YEARS 1910 TO 1912.

	TUBERCLE OF THE LUNGS		OTHER TUBERCULAR DISEASES	
	Indoor	Outdoor	Indoor	Outdoor
Madras City	1,304	1,138	684	987
Province of Madras	3,661	16,475	1,795	12,402
Calcutta (1911 and 1912 only)	1,577	2,237	241	1,147
Province of Bengal	2,464	7,967	643	3,627
Bombay City	1,051	3,728	1,549	2,992
Province of Bombay	3,142	15,397	3,036	13,529
Rangoon	1,068	1,133	136	475
Province of Burma	1,156	3,850	546	1,753
Total	16,423	51,925	8,630	36,912

The statement shows that everywhere, except among in-patients in the Bombay hospitals, the admissions for tubercle of the lung exceeded—often greatly—those from other forms of tuberculosis. They formed 65 per cent. of the total tubercular in-patients and 58 per cent. of the tubercular out-patients.

In the paper before referred to Major Rogers states that 96·4 per cent. of the bodies he examined showing evidence of tubercle showed signs of pulmonary tuberculosis; intestinal tuberculosis, often secondary, being next in order of frequency—65·9 per cent.

The opinion of early medical writers that scrofula is very rare in India has already been alluded to. I have been unable to obtain statistics to show the proportion which such cases constitute of "tubercle other than of the lungs," but it is evident, from Major Rogers's paper, that this proportion is not large. This is also borne out by the fact, shown in a table by Major Stevens, that during four years, 1904-08, only 124 of such cases were admitted to the Medical College Hospital, Calcutta. Of these, 38 were cases of tubercular glands, 81 of bones, and 5 of the skin; of the glandular cases, 35 were of the neck, 2 of the axilla, 1 of the groin, and 2 of the testes.

So far I have been dealing with tuberculosis in the human subject only, and the facilities for the spread of such infection will, I think, have been evident from what I have stated. As to the virulence of infection, I would point to the way in which tuberculosis spreads in the Army, and particularly in jails, in India. And I may say that many of my correspondents have dwelt upon the high fatality of cases of phthisis, and upon the rapidity with which the disease has spread once it has been introduced. Instances have been given of whole families having been wiped out by phthisis following upon the introduction of infection by one of their members. It would seem, therefore, that there is no necessity to look for other than human infection to explain the spread of tuberculosis in India. As, however, the question of infection of human beings with bovine tuberculosis is one that has aroused much interest at home, I give such information as I have been able to collect regarding the presence of tuberculosis among cattle in India.

TUBERCULOSIS AMONG CATTLE IN INDIA.

With regard to this subject I would first like to refer to a paper entitled "Human and Bovine Tuberculosis in India," written by Dr. Nield Cook, when he was Medical Officer of Health of

Calcutta, and to be found in the *Transactions of the Epidemiological Society* for 1902-03.¹ In this paper Dr. Nield Cook comes to the conclusion that bovine tuberculosis is found, but is a comparatively rare disease in India. He states that, during the twelve years he had been a Medical Officer of Health in India, first in Madras and then in Calcutta, he had never discovered a single case of tuberculosis among cattle, although he had inspected the carcasses and viscera of many thousands of cattle in the slaughter-houses, and had also examined the udders of many milch-cows. He also quoted the Superintendent of the Municipal Slaughter House at Calcutta, a European butcher, as saying that he had never seen "grapes" in the pleura in India, although he saw about 100,000 carcasses of cattle a year. Dr. Cook also reproduces a letter from Dr. Lingard, the Director of the Imperial (Veterinary) Laboratory at Muktesar, in which he says that he had never come across a single case of tuberculosis in India proper or Baluchistan, and that during twelve years in which he had been endeavouring to obtain evidence of tuberculosis in cattle in India, only two officers had stated that they had recognized this disease—one, Major Mills, of Bombay; the other, Major Evans, at Rangoon. Major Mills, the Principal of the Bombay Veterinary College, informed Dr. Cook, speaking from an experience of twenty-two years of active work, that he was of opinion that tuberculosis was a very rare disease of cattle in India. As evidence of the healthiness of the cattle in certain famine districts in Bombay, Major Mills mentioned that in forty-two post-mortems he found signs of tuberculosis in one animal only. As the result of further inquiries, Dr. Nield Cook was able to obtain evidence of 60 cases of tuberculosis among cattle in India; 31 of these occurred among the 4,155 patients at the Bengal Veterinary College Hospital, between 1893 and 1903, and 21 between 1900 and 1902, among the thousands of cattle at the Government Cattle Farm, Hissar, Punjab.

Such little information on this subject as I can add points in the same direction as that collected by Dr. Nield Cook over ten years ago. I have examined the annual reports of the Superintendents of the Civil Veterinary Departments of the different provinces of India for the last five years and have written to several officers of the Veterinary Department, to whom I am indebted for much of what follows.

The references to tuberculosis in the Veterinary Reports are very meagre. The reports contain statements of the number of different animals treated at the Veterinary Hospitals and dispensaries, the number

¹ *Trans. Epid. Soc. Lond.*, 1902-03, xx, pp. 151-59.

of bovine cases treated being many thousands annually, varying from a few hundreds in Burma to over 130,000 in the Punjab. In the reports of five provinces—namely, Bihara, Orissa (one year), Eastern Bengal and Assam (three years), Assam (two years), Bombay (five years), and Sind, Baluchistan and Rajputana (five years), no mention is made of tuberculosis. In the reports of other provinces "tuberculosis" is included as being one of the causes of death of cattle, other than the acute epizootics, and in some cases special references are made to tuberculosis. Thus in the Punjab report for 1911-12 it is stated that a case of tuberculosis was detected in the dairy herd at the Central Jail, Lahore, and the whole herd was tested with tuberculin. In the report for the following year mention is made that three cases of suspected tuberculosis in cows of the same herd were tested with tuberculin, but the result is not stated. The Inspector-General of Jails, Punjab, Colonel Braide, I.M.S., has kindly furnished me with further information from which it appears that in October, 1911, a veterinary officer visiting the dairy of the Lahore Central Jail expressed the opinion that a sick cow was possibly suffering from tuberculosis of the lungs. The whole herd was tested with tuberculin, and eleven cows and one buffalo gave a doubtful reaction. Two of the cows died shortly afterwards, and the examination of the carcasses showed in one of them the presence of generalized tuberculosis. The rest of the animals which had given doubtful reactions to tuberculin were segregated for about three months, when a further test yielding a negative result their milk was again taken into use. In 1913 another cow of the herd died, and was found on post-mortem examination to be infected with tubercle, and another cow in which tubercle was also diagnosed was slaughtered. All the cows of the herd were again tested with tuberculin, but were reported to be free from tubercle.

There had been a good deal of tuberculosis among the prisoners of the Lahore Central Jail for some years past, but this was the first occasion on which tuberculosis was detected, or, I believe, even suspected among the cattle of the jail dairy. It seemed possible, therefore, that the cattle might have become infected from human patients in contrast to infection in the reverse order. I therefore wrote to the Pathologist of the Punjab Veterinary College, asking if any attempt had been made to determine the type of the *Bacillus tuberculosis* found in the carcasses of the cows from the jail. He replied that no such attempt had been made; he added that the lungs, spleen, &c., of one of the cows yielded very fine specimens of tubercle.

In the Veterinary Reports of the United Provinces, tubercle is included among the minor causes of cattle mortality, and in the Report for 1911-12 it is stated that a thorough inquiry is now being instituted into this disease. In reply to my inquiries, the Superintendent of the Civil Veterinary Department, Mr. E. W. Oliver, kindly informed me that this inquiry had been commenced by the appointment of a Veterinary Assistant to inspect carcasses in slaughter-houses at Cawnpore, when, between August and October, 1912, approximately 2,000 carcasses were examined, of which about 3 per cent. were affected with tuberculosis in varying degrees. All obvious cases appear to have been noted as the result of their naked-eye appearance only. The doubtful cases were sent to the laboratory at Lucknow for microscopical examination. Of the animals slaughtered, 80 per cent. were cows, 15 per cent. buffaloes, and 5 per cent. bullocks; the proportion of each class of animal found to be infected is not stated, though it is mentioned that, as was expected, most cases were found amongst cows.

In the Report for 1911-12, the Superintendent of the Civil Veterinary Department, North-West Frontier Province and North Punjab mentioned tuberculosis as amongst the minor causes of cattle sickness and mortality. The cases, he informed me, numbered seven, of which five were cows and two were buffaloes. The diagnosis having been made by Veterinary Assistants upon clinical examination only, is regarded as being unreliable; no details are available. The Veterinary Reports of Bengal include those of the Civil Veterinary Department, and of the Veterinary College at Belgachia, near Calcutta. I could find no mention of tuberculosis in the former, but the latter recorded several cases of the disease. Thus, in 1908-09, nine cases of tuberculosis were diagnosed in cattle and some pure cultures obtained; and in 1909-10 six cases were diagnosed in cows and buffaloes and one in a monkey. In these years also mention is made of an outbreak of tuberculosis among the milch cattle at the Presidency Jail, all of which were tested with tuberculin; those that reacted were brought for further dissection to the Veterinary College, where one of them died "of a complication of tuberculosis and acute piroplasmosis." I regret I have not been able to obtain further particulars of the outbreak.

Pathological specimens from Bengal, Bihar, Orissa, and Assam, and from the Army Remount Department and other sources, were examined at the Veterinary College; several showed the causative organisms—among a variety of others—of tuberculosis.

From 1908-09 onwards the staff of the Veterinary College, Calcutta,

undertook, at the request of the Health Officer, the examination of calves before use as vaccinifers at the Animal Vaccine Depot, including the application of the tuberculin test. Of 294 calves so examined and treated, none appear to have shown any sign of tuberculosis. In the Report of the College for 1900-01 attention is invited by the Principal to the occurrence there of four cases of tuberculosis, with reference to a quotation from an Annual Report of the Imperial Bacteriologist, in which the officer remarks: ". . . I have not met any veterinary officer who has observed tuberculosis in cattle in this country"; the Principal adds: "Every year cases of advanced tuberculosis are admitted in this infirmary, die, and are confirmed by post-mortem examination." Again, in the Report of the College for 1906-07, the following remarks are made: "Investigations have been carried out with regard to suspected tuberculosis in various places. I am glad to say that we failed to discover the disease in several suspected cases in jails, but the disease has been found in cows several times in the College hospital. The number of cases of this description admitted yearly at Belgachia is sufficient to indicate that tuberculosis prevails in Calcutta."

The only reference to tuberculosis that I was able to find in the Madras Veterinary Reports from 1908-09 to 1912-13 was in that for 1911-12, in which it is stated that a specimen was sent to the Madras Veterinary College for examination for tubercle with a negative result. The total number of specimens of all kinds recorded for examination during this year was 402. Both the Superintendent of the Civil Veterinary Department, Madras, and the Principal of the Madras Veterinary College have informed me that tuberculosis is not known to exist among cattle in Southern India; and both attribute this to the same cause—namely, the open-air life of the cattle.

In the Burma Veterinary Reports, for the same period, I was also able to find but one reference to tuberculosis. It occurs in the Report for 1909-10, and is as follows: "The Superintendent of Mandalay Jail, suspecting tuberculosis, expressed a desire to have his cattle tested, and 51 animals were injected, but there were no reactions."

The Imperial Bacteriological Laboratory maintained by the Government of India at Muktesar, near Naini Tal, is chiefly concerned with veterinary research. I wrote to its Director, Major Holmes, A.V.D., who, in reply, said that he had no personal experience of bovine tuberculosis in India, and that during the past seven years he had had about four specimens sent for examination in which tubercle bacilli were found.

It must be mentioned that the Indian veterinary returns are almost entirely based upon the observations of practitioners trained in the country, where little or no opportunities exist for clinical instruction in tubercular disease of animals. It might well be, therefore, that cases of tuberculosis in cattle or other animals might have escaped notice at the veterinary hospitals and dispensaries. On the other hand, were the disease at all prevalent in India, the morbid materials sent to the veterinary laboratories for examination would almost certainly have furnished a larger proportion of specimens of tubercle than has been the case.

With regard to the submittal of morbid materials for examination, it should be mentioned that veterinary autopsies are uncommon in India, and that the inspection of meat where undertaken is usually very imperfectly carried out, at least as far as regards the meat supply of the civil population. All that is done in most instances is, that animals are inspected previous to slaughter, and only such as are obviously ill or greatly emaciated are rejected; moreover, the duty, while sometimes carried out by veterinary assistants, is more commonly entrusted to men who have no veterinary knowledge or experience.

In some of the large cities and in towns with a considerable European population, such as the hill stations, arrangements exist for the inspection of meat. In Simla, to quote conditions with which I am familiar, animals are inspected both before and after slaughter by a veterinary assistant. This officer, according to the remarks of the health officer of Simla at the Punjab Sanitary Conference of 1913, has never met with a case of tuberculosis in cattle during his nine years' experience at Simla, where some 5,000 head of cattle are slaughtered annually. I may say that throughout the Punjab cows are the only animals slaughtered for beef, and are thus subject to inspection. They are for the most part barren and thus useless, as cows are not employed for draught purposes. Worn-out draught oxen and buffaloes are slaughtered for their hides and horns, but their flesh is not eaten, except by members of very low castes. In cantonments, however, meat for the use of troops is subject to inspection, and the slaughter-houses are under official control or supervision. Should tuberculosis of cattle be at all common in India cases of it would certainly have come to notice in the cantonment slaughter-houses from time to time. I have, however, been unable to find any record of such cases.

In many cantonments Government herds and dairies exist for the supply of milk and butter to British troops. I have been informed that

tubercle is uncommon in these herds, but that in 1913 two cases in the dairy herd at Peshawar reacted to tuberculosis, and on being slaughtered were found to be tubercular. Many of the milch cattle in these herds are the product of English bulls and Indian cows. The bulls are understood to have been tested for tubercle before leaving England, and the cows are, as a rule, kept for a period of probation before purchase, many being also tested with tuberculin.

Bovine tuberculosis being such a rare disease in India, the danger of infection of human beings by means of milk or beef would seem to be almost negligible. Such danger as might possibly exist is greatly diminished by the circumstances that large sections of the Indian population, including all Hindus, never eat beef, and that milk is almost invariably boiled before use. Not only is milk boiled but butter is rarely used before it has been converted by boiling into clarified butter or "ghi." A still further factor in the elimination of infection through milk is the fact that buffaloes, which furnish a large proportion of the milk used in India, especially for making butter and "ghi," are even less affected with tuberculosis than are cows.

DISCUSSION.

The PRESIDENT (Dr. W. H. Hamer) said the study of questions such as that discussed in the paper materially helped to broaden their views. They all remembered being taught that the Great Fire cleared London of plague, and then later came the shock of discovery that when plague left London it left Western Europe too. The study of tuberculosis in India was perhaps calculated to produce in their minds a similar kind of shock with regard to some of the ideas which had been, or were still, current concerning the disease. He, personally, could look back to the time when they, in this country, were in the "*tap dikh*" stage—the stage when "consumption" was in very many instances classed in mortality returns under "respiratory diseases." Colonel Wilkinson did not venture to suggest that in India "a column for 'phthisis' or 'tubercle of the lungs' should be added to the general mortality returns, for (he said) the information available is far too unreliable to justify such a procedure." In this country the column in question had been added, and it was generally agreed that the altered nomenclature thus brought into use had, incidentally, greatly complicated matters. They had now, however, apparently arrived at a stage when they must consider whether the heading of the column must not again be revised: whether, in fact, the term "tubercle of the lungs" would continue to satisfy them. In a recent paper, read before the Pathological Section of the Society, stress had been laid on the difficulty of demonstrating tubercle bacilli in early phthisis, and there was

much talk nowadays about the existence of a "pre-tubercular stage." A point which specially interested him was the proportion of cases of "other tubercular diseases," and "tubercle of the lungs." Statement VIII showed a fairly high proportion of "other tubercular diseases," and this was particularly interesting having regard to the information before them regarding the limited use of cow's milk and the small extent of prevalence of tuberculosis among cattle in India. He would ask General Macpherson if he would be so good as to open the discussion.

Surgeon-General W. G. MACPHERSON said all must welcome Colonel Wilkinson's paper, more especially because it opened up ground which was much in need of careful study. There were one or two points in it about which he might venture to make some remarks. He would first of all refer to the statistics, which the author quoted as indicating an increase of tubercular disease amongst Indians. Now, statistics, collected as they must be collected under present and past conditions in India, were, in his opinion, absolutely unreliable, so far as they could indicate progressive increase or decrease in a disease such as tubercle. They were not in any way comparable in this respect with the statistics compiled from records and returns in this country. His own personal experience during the past three years in India, in dealing with Indian troops and followers, and with the cases brought forward for invaliding, was that numbers of cases of manifest tubercle were never diagnosed as such, but were returned as chronic bronchitis, or some other chronic disease. Then again, as regards the statistics in Statement IV of Colonel Wilkinson's paper, which were brought forward to indicate differences of incidence of tubercular disease in the Indian Army in geographical areas, we must remember that under the changes carried out by Lord Kitchener during the last few years Indian troops were no longer confined to geographical areas, but were moved all over the Indian Empire; so that we could not deduce anything from incidence of tubercular disease in the Indian Army according to geographical areas but only according to India as a whole. He must therefore emphasize what he had stated—namely, that we could not determine the movement of tubercular disease in India, either in time or space, from the present and past condition of statistics in that country, and could not therefore say definitely whether it was on the increase or decrease. All we could say definitely was that it was much more prevalent amongst the Indian than amongst the British troops in India. This was the one great fact which we were able to accept; and, having accepted it, we could enter into some practical explanation of the fact. The explanation seemed to him simple enough; it was the explanation of tubercular disease in all communities where it had been notoriously prevalent (for example, amongst the Guards in London, the poorer classes in Ireland, and the natives of Gibraltar)—namely, overcrowding in badly lighted and badly ventilated dwellings. This condition of life existed in a specially aggravated form in India: and, speaking of Indian troops and followers, he would say this was specially the case amongst the married soldiers and followers. It was by no means uncommon

to find the man and his wife with three or four children and an extra relative or two occupying an unlighted and unventilated room measuring 10 ft. by 9 ft. by 10 ft. It was their normal state, one might almost say. It was satisfactory to note that steps were being taken now to remedy this state of affairs, and to raise the standard of habitations both for the troops in barracks and for followers. In this respect there was a hope that a definite decline in tubercular disease would set in. But, in order to bring this about, we not only wanted reliable compilation of statistics, as the compass to guide us, but also to maintain a persistent attack on conditions of overcrowding associated with lack of light and ventilation. He was struck by Colonel Wilkinson's references to the lesser prevalence of tubercular disease in Madras than in other presidencies and cities in India; and, although he was not prepared to say that there was anything in the suggestion, it had occurred to him that the influence of Florence Nightingale might have been felt more in Madras than elsewhere in India, for we knew how persistent and untiring were her efforts to improve the sanitary conditions of life amongst the natives of India and, if he remembered rightly, she had more influence with and sympathy from some of the Governors of Madras than from others. He must apologize for want of precision in making these remarks. He had not had an opportunity of seeing Colonel Wilkinson's paper, or of knowing the lines upon which it went, until he had just heard it read. He could only conclude by again saying how much he welcomed it and how interesting and important was the subject with which it dealt.

Lieutenant-Colonel A. M. DAVIES considered that spread of tuberculosis by direct infection held the chief place in the causation of the disease in India among the native population; instancing especially its excessive occurrence: (1) among women, both Hindoo and Mohammedan, due to their indoor life and want of fresh air and exercise; and (2) among the hill tribes, owing to their aggregation in crowded, unventilated huts. In relation to this might be noted the excessive phthisis mortality in some parts of Great Britain, particularly in South Wales—e.g., Cardigan had a phthisis mortality in 1905-09 of 2·237 per 1,000, nearly double the average for England and Wales, 1·125 per 1,000; the local custom prevails of sleeping in a "box bed," the whole family being crowded during the night hours into a small cupboard, rendering infection most likely. On the other hand, the great decrease in the occurrence of tuberculosis among British troops in India during recent years was chiefly attributable to the greatly improved health conditions of service, among which improved barrack accommodation and increase in temperance are to be mentioned, as well as much more of an open-air life and exercise during the hot weather than was formerly the case. The admissions for pulmonary phthisis in the Bengal Army (European) for the decennium 1870-79 averaged 8·3 per 1,000; in 1879-84 they were 7·0 for all tubercular diseases; in 1886-90 for the European troops in India all tubercular admissions were 3·5, and in 1891-1900 they were 4·2 per 1,000. In 1907-11 these admissions had fallen to 1·60, and in 1912 they were only 1·20 per 1,000. This great improvement was due to a more rational mode of living, temperance and fresh air.

The Rev. Dr. K. W. S. KENNEDY said that the chief interest for him in Colonel Wilkinson's paper lay in its evidence of the increase of tuberculosis in India. For whether this could be proved or not by the statistics he had so ably presented he had no doubt whatever of the fact. And he had had specially favourable opportunities of observing it, for he had been over twenty years in the same part of India—Chota Nagpur, in the Bengal Presidency. He went out from Ireland where tuberculosis was so common, and was at once struck by its extreme rarity in Chota Nagpur. And he could trace what seemed the causes of its increase there. As a consequence of the reputation of Hazaribagh, where he was stationed during his first ten years, in the northern part of Chota Nagpur, as a place free from the disease and favourable for such patients, some Calcutta doctors decided to open a sanatorium for European patients there. An ordinary bungalow was taken and a few patients sent up. But proper arrangements were impossible, and the medical missionaries joined with the civil surgeon in getting the place shut up. In itself it might not have done much harm. But unfortunately it set the fashion and soon it became common for Bengalis and others suffering from the disease to come up from Calcutta hoping for cure in the Hazaribagh climate. These people lodged in the bazar and all over the place, and he dated the great increase which all who practised there had observed in tuberculosis from that time. No statistics could alter the impression long residence had produced in his mind. And though for the last ten years he had been stationed further south in the district, he had had frequent opportunities of judging of the present conditions in Hazaribagh. Where he had been of late years in the south of the district the population did not consist of Hindus and Mussulmans, as it did chiefly in Hazaribagh, but of the aboriginal tribes. Here too the increase in tuberculosis had been most remarkable. In fact it had become a most troublesome problem how to deal with it. And here again he thought he could trace the sources to some extent. It was the practice for coolies to go from Chota Nagpur to Calcutta to work for five or six months each year and return to cultivate their land. He had seen many cases in such families, and found that the first to suffer had been to Calcutta. Again for some years past numbers of coolies went down to work in the coal-fields at Jherria and elsewhere. These people frequently returned infected. In their habits they were not unlike the Ghurkas, of the prevalence of tuberculosis among whom Colonel Wilkinson spoke. So long as they lived in their own homes the open tiled roofs secured a certain amount of ventilation, but when they went to the mines they frequently lived in tin-roofed houses in which it was possible to close every means of ventilation. Again he had special opportunities of tracing the course of the disease in families of whom some members had gone to Cawnpore. They sent a number of aboriginal girls to train as nurses there. So many contracted tuberculosis that they had had to give up sending them. He knew one family into which it was introduced by one of these girls in which it had spread in an extraordinary way—one member after another dying of it. The habits of these aborigines promoted rapid spread and infection. It was not

only that they, like most Indian people, invariably slept with the blanket or sheet over their heads, thus lowering vitality and producing the most favourable atmosphere for rapid development of the disease, but they almost invariably slept on mats on the floor. And in the cold weather it was common for them to pull one of these great mats, which they made from a species of palm leaf, over the whole family, which lay together on the floor. The way in which this favoured tubercular infection was obvious. Of the increase of tuberculosis in Chota Nagpur he had no doubt whatever. It had, in fact, become a great and distressing problem how we were to deal with it.

Major S. L. CUMMINS, R.A.M.C., suggested that light might be thrown on the question of tuberculosis in India by studying the epidemiology of the disease in other non-European countries. Evidence was accumulating that races living in a state of primitive culture, as, for instance, most African tribes, did not suffer from tuberculosis to any considerable extent. This was not due to good sanitation, for the overcrowding and absence of ventilation in the native huts were well known. The explanation was simply the absence of the tubercle bacillus. As a contrast to this freedom from the disease under natural conditions it was found that these natives showed an intense susceptibility to the infection when brought in contact with civilization. Much work had been done in mapping out the distribution of tuberculosis in Africa by Ziemann and Peiper, and amongst the Kalmuk Tartars by Metchnikoff and Burnet. These observers had applied the von Pirquet cutaneous reaction for this purpose with most valuable results. In Europe, as was well known, a high percentage of clinically healthy adults gave a positive reaction to the test. It was found that, amongst Africans and other primitive peoples, a very small number of individuals reacted to von Pirquet's test, and this low percentage of reactions went hand in hand with a marked susceptibility to the disease, as compared with civilized races. The conclusion could hardly be avoided that the susceptibility of the primitive tribesman was due to his never having been obliged to acquire a relative immunity through contact with the tubercle bacillus. Applying this hypothesis to India, a country where every stage of culture, from the most primitive to the most advanced, was to be met with, it might be anticipated that great differences of susceptibility to tubercle would exist, and Army statistics did, in fact, show that the incidence of the disease varied markedly in regiments recruited from different tribes. The observations of the Rev. Dr. Kennedy afforded a most interesting example of the ravages of tuberculosis when once introduced into a highly susceptible community previously free from the disease. A thorough investigation of the distribution of tuberculosis in India by means of the von Pirquet reaction might supply a sound basis for measures of prevention. Meanwhile, it seemed illogical that the highly susceptible Ghurka or Dogra soldier should be allotted a smaller amount of air space in barracks than the less susceptible European. Of course, this was a question of money, but the money ought to be found.

Lieut.-Colonel O. L. ROBINSON, R.A.M.C., said he was afraid he could not usefully add anything to the discussion, as his experience in India had almost entirely been confined to British troops. He would like to say, however, that he generally agreed with what had been said by Surgeon-General Macpherson, and from what he had seen of Indian troops he was inclined to think that the greatest incidence of tuberculosis was to be found among the married non-commissioned officers and men, and more particularly among their families. In those stations in India in which the winter was cold, the residents in the family quarters were very apt to block up any ventilation openings and to keep all the windows tightly shut at night during the colder months. In addition there were not infrequently relatives of the occupier of the quarter, other than his wife and children, stopping with him, so that the condition of the atmosphere at night must be very impure. It was easy to understand how a lowered condition of health might be produced in this way, particularly among "purdah" women, and how easily tuberculosis (tubercle of the lungs) might be spread from one member of the family to another. Soldiers when invalided for tubercle of the lung might be the means of spreading the disease in their native villages.

Fleet-Surgeon P. W. BASSETT-SMITH, C.B., said there was one point that had not been touched on so far in the discussion of this most interesting paper which provides so much food for thought. In the paper of Major Rogers it was said that 97 per cent. of the bodies examined post mortem showed signs of pulmonary tuberculosis (this was apparently an error), but with any degree of infection in the towns, at any rate, the progressive increase of the population which has been going on for years and the associated overcrowding of the dwellings must be an important factor in the increase of tubercular disease; given the presence of the germ, this overcrowding, with the habits of the people, would favour the extension of the infection, especially in the cold and wet weather. With regard to the statistical evidence, a serious error was probably introduced into the Bombay statistics during the first eighteen months of the plague epidemic (1896-97), for then many cases of acute pneumonic plague were returned as deaths from phthisis, partially from ignorance and partially with the intent to conceal the more serious disease.

Lieut.-Colonel WILKINSON, in reply to Surgeon-General Macpherson, pointed out that in his paper he had not claimed any high value for his statistics, but he believed that, on the whole, they were fairly reliable—especially those of cities—and they certainly showed a conspicuous rise in the proportion of patients treated for tuberculosis. The reorganization of the Indian Army by Lord Kitchener had probably had some effect upon the statistics of tuberculosis, for by diminishing the recruitment of Madrassis, who were comparatively slightly affected by tubercle, and by increasing the number of Gurkhas who suffered badly from the disease, the reorganization would tend to increase the admissions for tubercle; he believed, however, that the admissions for this disease among other classes of troops had also increased during the period

referred to in his Statement IV. He was glad to have the great experience of Dr. Kennedy in support of his belief that tuberculosis was on the increase among villages, and that this increase was probably due to the importation of infection from larger cities. With regard to tuberculosis among Indian Christians generally, he might say that this was a matter which appeared to be causing a good deal of anxiety to missionary bodies in India. Many of the converts were from the lower strata of the population, and in some of the large cities they lived under extreme conditions of poverty and overcrowding. The remarks of Major Cummins regarding the absence of tuberculosis among certain African tribes, and the greater severity of the disease among Sudanese troops than among Egyptian troops, were of great interest. He (the speaker) had referred to the rapidly fatal course of phthisis among certain classes in India: some of his correspondents had dwelt especially upon this point, and had also mentioned the way in which whole families had been carried off by the disease within a short time of infection having been introduced by one of their members. This seemed to be especially the case among aboriginal people, such as the Santals of Chota Nagpur and the Bhils of certain parts of the Bombay Presidency, but striking instances of it had also occurred among the villagers of the North-West Frontier province. It seemed to him that the people in many parts of India were in a condition, as regards tuberculosis, comparable to that of African tribes and of the Sudanese soldiers mentioned by Major Cummins—that is, they had only recently been exposed to the infection of tuberculosis, and had not acquired any resistance to it.

As regards the question of the introduction of tuberculosis resulting from the contact of people of different degrees of civilization, it would be very difficult at this stage to decide whether Indians owed the infection of tuberculosis to Europeans. The contrast between the attitude of the earlier medical writers towards tuberculosis in the two races with that of medical men of the present day was, however, very striking and suggestive. In the old days such references as were made to tuberculosis in India were chiefly concerned with its manifestations in Europeans—soldiers and sailors, among the latter of whom it appears to have been rife in Calcutta; nowadays it is the prevalence of tuberculosis among the Indian population that arouses most attention. This contrast might be briefly expressed by saying that, in the earlier days, tuberculosis *prevailed* amongst certain classes of Europeans and was *met with* in Indians; now it *prevails* among Indians and is *met with* in Europeans. As far as he (the speaker) knew, there had been no systematic application of the von Pirquet test in India. The Principal of the Lahore Medical College had informed him that a number of students had given a positive reaction to this test, although they seemed to be fairly normal otherwise.

With regard to Fleet-Surgeon Bassett-Smith's remarks as to the inclusion of deaths really due to pneumonic plague among those ascribed to tuberculosis in Bombay in 1896-97, he thought that this would only have occurred to a very slight extent. Such deaths were far more likely to have been shown under "respiratory diseases" than under "tubercle of the lung."

The statement of Dr. Butler that tuberculosis had decreased in England with the increase of communications was very interesting. It was probable, however, that in England improvements in sanitation had been as great as, if not greater than, the improvements in communications. In India this was not the case ; there the situation was that twentieth-century communications co-existed with the sanitary conditions of the Middle Ages ; the improved communications thus facilitated the distribution of infection under conditions very favourable to its spread.

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